GULICK HYGIENE SERIES

HEALTH AND SAFETY

BY FRANCES GULICK JEWETT

THE GULICK HYGIENE SERIES

EDITED BY

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THE GULICK HYGIENE SERIES

FIVE-BOOK SERIES

Book I. Good Health

Book II. Emergencies

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TWO-BOOK SERIES

Health and Safety

Physiology, Hygiene, and Sanitation

The Body and its Defenses

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PREFACE

The pages of this small volume are rather strictly devoted to matters of personal health. They discuss the care of the eyes, the ears, the hair, the finger nails, the teeth, etc. At the same time they also give reasons why cleanliness and care are important and why uncleanliness and neglect are dangerous. They not only show in a general way that health and cleanliness go hand in hand but they make it plain that we clean our teeth to save them from the microbe, that we keep dust and flies out of our homes because disease microbes may come in with them, that we breathe pure air and ventilate our homes because clean air is best for health. In all this, however, care is taken not to alarm the reader more than enough to forearm him against his worst foe — the microbe.

Attention is called to the nature of air and to things that may spoil it — the breath of human beings, decaying substances, burning oil and gas, flying dust, etc. Methods of ventilation are discussed and experimental investigation is encouraged.

Facts about sleep are given, with clear reasons why sleep is imperative. Other facts show what may be

done for health by means of the skin — through the cold bath, through friction, exercise, and the like. Then too there are rules for the protection of the eyesight and still others for the guidance of everyday eating.

In presenting the subject of alcohol — as required by state law — the picturesque history of Bum and Tipsy is brought direct from the records of scientific investigation. Rarely has a man made a stronger appeal against alcohol than Dr. Hodge has done in these experiments carried on in Worcester, Massachusetts.

In preparing *Health and Safety*, there has seemed to be every reason for retaining the material of *Good Health*. There are also very real reasons why — in addition — accidents and emergencies should be discussed in condensed form. This, therefore, has been done in the two closing chapters of the book. The new material covers the treatment of such everyday accidents as bruises, cuts, broken bones, sprains, etc., and such emergencies as fainting, clothes afire, and nosebleed, with directions as to what to do to secure artificial respiration. The rules for action in case of accident are easily understood, and once they are mastered the children will apply them with the enthusiasm of the expert. It is indeed the intent of this book to trust young people with such facts of experience as will increase their efficiency for the entire span of the years of life.

F. G. J.

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HEALTH AND SAFETY

CHAPTER I

BREATHING AND PURE AIR

Go and watch the baby when he is asleep. See how his chest rises and falls, then rises and falls again.

He does not know what he is doing, but he breathes as perfectly as the oldest and the wisest man in the world. He began to breathe when he was born, and he will not stop until he dies; still he does it without thinking about it.

There is a special kind of machinery in each of us that takes care of our breathing even when we are asleep. Nobody has to be clever or old or good to know how to breathe, though each of us can stop our breathing if we care to try.

See how long you can hold your breath and be comfortable.

In some places men dive in the ocean for pearls. They pick up the shells that hold the pearls, and the longer they stay under water the more pearls they can find. For this reason they hold their breath as long as they

possibly can. Yet even these pearl divers cannot go without breathing for over four minutes at a time.

In fact, there is no way for any of us really to stop breathing for a long time and keep alive. It is the same with animals.

If you should hold a bird in your hand, and if he were perfectly quiet and did not even breathe, you would know

BREATHING WHILE HE SLEEPS

that he was dead, for breathing is as important for birds and animals as for children and men.

No one needs to tell us that what we breathe every minute of every day is air. It is around us everywhere, like a wonderful ocean that we cannot see. It also stretches so far above us and above the clouds that, try as we may, we cannot get outside of it.

Now this ocean of air is made up of several kinds of gases mixed together. Each is different from all the others, though not one of them is the gas that lights our houses. Indeed, the gas we use for lighting is different from the gases of the air in three ways:

1. It will kill us if we breathe much of it.
2. It has a smell.
3. It will burn.

Still we find that air gases are like this deadly gas in two ways:

1. We cannot see them.
2. We can feel them when they blow against us, or when we run through them.

If you blow on your hand, you feel the air even though you cannot see it. So, too, when the wind blows, you do not see it, but you feel it rushing past.

There are men who can take a bottle full of air, separate it into its different gases, and study each gas by itself. Just now, however, you and I need to pay attention to only two of them, — oxygen and carbon dioxide.

If I should put a mouse into a jar with a good deal of oxygen in it, he would act so merry that you would think he had never before in his life felt so happy. If I should then fill another jar with carbon dioxide and put the same small mouse into it, he would surely die in a minute unless I pulled him out again as promptly as possible.

This shows the difference between oxygen and carbon dioxide: one is our friend, the other our enemy. Fortunately, in fresh, outdoor air there is always much oxygen and little carbon dioxide.

A change comes, however, in the rooms where people live and breathe, for when you take a deep breath of sweet, pure air the lungs use up a part of the oxygen at once; and when you expel the air from your lungs, carbon dioxide is there in place of the oxygen. The exchange is made inside the lungs.

It is plain, then, that breathing takes oxygen out of the air and puts carbon dioxide in its place.

If a man is in a very small room, and if no fresh air can get in from anywhere, his breathing will change the air in the room so much that if he stays there long enough he will die. One of the saddest cases of this kind was in India when the British and Hindoo soldiers were fighting each other. Finally the Hindoos captured one hundred and forty-six British prisoners and put them into a room that was about twenty feet square. It had two small windows, so that a little air did manage to get in; but there was not enough of it for so many people. Fresh air could not enter fast enough to give the men the oxygen they needed, and the air that was in the room grew worse and worse until everybody suffered and gasped for breath, and when morning came only twenty-three of the men were alive. The rest had died

for lack of oxygen. Ever afterwards, in memory of that terrible night, the room itself was called the Black Hole of Calcutta.

It is fortunate for us that air does not often get so bad as that in any room.

QUESTIONS

1. How long can a man go without breathing?
2. What difference is there between the air we breathe and the gas we burn?
3. Which gas in the air keeps us alive?
4. What would happen to us if we could get nothing but carbon dioxide to breathe?
5. What happened in the Black Hole of Calcutta?

CHAPTER II

PURE AIR AND THINGS THAT SPOIL IT

Sometimes when you get up in the morning you feel happy and rested and good-natured. When your shoe string breaks you laugh, and when a button comes off you think it quite a joke. Then perhaps the very next day everything goes wrong from morning until night; it is hard to be good on such days, and harder yet to be cheerful.

Of course the reason is not always the same, though you will often find that you slept in pure air the first night and in impure air the second night. In fact, that is always enough to make a great difference in our feelings the next day. In pure air our lungs get more oxygen and we sleep well; if we sleep well we are rested, and when we are rested, it is the easiest thing in the world to be kind and cheerful. On the other hand, when we are not rested we can hardly help feeling cross.

The same is true about learning our lessons and reciting them well, though even teachers forget this sometimes.

I can think of two schoolrooms. In the first the children look unhappy; their eyes are dull and their

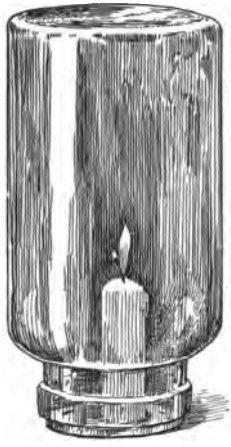
cheeks are flushed, though some of them have pale faces instead. Only a few sit up straight, while none of them look as if they enjoyed studying. One class is reciting a spelling lesson, and I notice that several of the children miss the easiest words. In this room the air is wretched. I look around and cannot see any place for fresh air to enter.

The second room is of the same size, and although it holds the same number of children, still everything here is different. Both the girls and the boys look as if they enjoyed studying, most of them are sitting up straight, their eyes are bright, they do not often miss the easy words, and nobody looks cross. As might be expected, enough fresh air is coming into the room all the time to keep it fresh and pure.

If you should put very many dogs or other living creatures into a room, and then shut every door and window, the animals would use up the air as fast as children do; and if they could get no more, they would die as those men died in the Black Hole of Calcutta.

Last summer a ten-year-old friend of mine caught a mouse by the tail and put it under a tumbler. She was afraid it would not get air enough, so she slipped a pencil under one edge of the glass to hold it up and let the air get in. She was so careful of the health of the mouse that it lived merrily, until one day the glass tipped over and it ran away.

Turn now to grass and trees. Notice the green leaves as they flutter in the sunshine. You would not suspect it, but even while you watch them they are at work. Each separate one is indeed taking carbon dioxide from the air and is uniting it with water to make food for itself; and later the food becomes part of the plant. Also, while these changes go on, the plant gives off some of the oxygen which is freed from the carbon dioxide.



USING UP THE OXYGEN

Now this part of plant life goes on only in the light. But continually, by night as well as by day, plants live by what they are able to do with oxygen and carbon dioxide. The truth is that the growth of every plant is a complex and wonderful affair; for, whether they are in the sunshine or in total darkness, they depend both on oxygen and on carbon dioxide for their continued existence.

Light a small candle, set over it a glass jar that fits down flat on the table, and watch the flame. At first it will burn as brightly as ever; then it will grow more and more dim, until at last it will go out entirely. If you should now put a mouse or bird into the jar, it would die at once, because the oxygen in the jar has been used up by the candle.

This is not all. Men have tried experiments with gas jets, and they find that when one of them is burning it uses up more oxygen than three people; that is, it will use up the air three times as fast as you or I do.

The next time you are in a lecture hall or a church in the evening, count the gas jets that are lighted. If there are one hundred of them, be sure to tell yourself that they are using up the oxygen as fast as if there were three hundred more people present.

This is bad enough, but it is worse yet to have a gas jet open when the gas is not lighted, for nothing spoils the air faster. People who do not know the danger sometimes make the terrible mistake of blowing the gas out instead of turning it off when they go to bed.

In December, 1903, in San Francisco, during one night, six people in six different houses died because the gas escaped into their rooms. They died because they breathed this gas instead of oxygen.

If you ever notice the odor of gas in a room, be sure to find out where it comes from and turn the gas off. In some cities the gas has no odor, and this makes it more dangerous.

Besides the odor of gas, other bad smells almost always show that something is spoiling the air.

Sometimes these unpleasant smells come from garbage cans and wagons. Sometimes they stream out of an unclean cellar or a basement, or from soiled rags tucked away

somewhere, or from food or meat that is spoiling. Such things should never be left where they can change the air.

In some cities more people die in one part than in another, and often the whole trouble comes from impure air. Those who breathe it are not as strong as they would be if they breathed only pure air, and on this account it is easy for them to become ill. Worse yet, when such people are once ill, if they have to keep on breathing the impure air, they are far more likely to die than if they were breathing pure air.

Let us do all we can to breathe pure air every day, so that we may feel well and be well, and learn our lessons with as little trouble as possible.

QUESTIONS

1. What difference does it make with our feelings whether we sleep in pure air or impure air?
2. Describe the two schoolrooms.
3. If a room should be filled with animals, and if they should get no fresh air, what would happen to them?
4. What do leaves take from the air?
5. What do plants do with carbon dioxide?
6. Which gases do plants use in breathing?
7. How can you show that a candle uses up oxygen?
8. How much more oxygen does one gas jet use than one man?
9. If a gas jet is open and not lighted, what harm does it do to the air of a room?
10. Why should we keep air free from smells of every kind?

CHAPTER III

TOBACCO AND PURE AIR

When I was a child one of the most interesting things every summer was to watch my uncle smoke his bees. He had ten hives and he thought he ought to

PREPARING TO ROB THE BEES

have some honey. But the bees wanted it themselves, and for this reason they were ready to sting him whenever he came to get it, — even as your father would shoot any burglar who came to rob him.

But my uncle knew a way to manage. He took a pipe, filled it with tobacco, and smoked it into each hive. At first the bees were excited and flew around as a man might do if his house were on fire. Nevertheless they had to breathe smoke instead of pure air, and it soon made them so dull that they could not fly and could not even sting. They stood still, or walked around slowly, and my uncle brushed them from one place to another and took as much honey as he wanted.

When the air in the hive became pure again the bees felt better and hurried off to visit the flowers. They wanted to get honey enough to fill their little barns again so as not to be hungry in the winter.

That story is just to show what tobacco smoke does for bees. It makes them rather stupid for a while, but it does not kill them.

Here is another story.

The other day I went to see a friend of mine who has a greenhouse. Everything was growing well, and I said, "But how do you manage to keep off the bugs and the worms?"

"Ah!" said he; "tobacco smoke does it." This surprised me, until he showed me great bundles of stems of tobacco leaves that looked like small twigs. He said he bought a ton of the stuff at a time. He also told me that the soft part of each leaf is used for chewing tobacco, for pipe tobacco, and for cigars, but that the

stems are saved for greenhouses all over the country. It seems that once every two weeks he himself uses these stems for small bonfires up and down all the straight rows of his greenhouse.

He takes an armful for each fire, spreads it out a little on the ground, lights it, and shuts every door and window to keep the smoke in.

After a while the room is so full of smoke that he cannot stay in it a minute himself because it makes him

SMOKING OUT THE INSECTS

deathly sick. But the bugs and the worms have shorter legs; they cannot run away. When, therefore, the stuff is burned up and the fires have smoked out, and the man goes in again, he generally finds the insects all dead. If some are alive, he gives them another big smoke the next day, and they never live to eat any more. Smoke from an ordinary bonfire would not do this.

Both of these stories show what tobacco smoke does for insects. But it is more important for you and me to know whether it can do us any harm. I met a man the other day who used to smoke sweet fern and grapevine stems when he was a young boy. He says smoking was great fun in those days and that it never made him sick, until once when he thought he would try a real cigar. He then took his pennies, bought the biggest cigar he could find, lighted it, and smoked about half an inch. He said he was so sick for five hours afterwards that he thought he was going to die. He went into the barn, lay down on the hay, and wished he could be a cow and not suffer so. When his father found him he felt better, but after that he never wanted to smoke again.

It is the poison in tobacco smoke that makes it so different from any other kind of smoke. It is this that made the boy sick when he tried to smoke the cigar, and it is this that killed the insects.

In another case the boy was not to blame. He was three years old and had a father who was a great smoker. This man played with his son, petted him, held him in his lap, and often they slept together; but he also noticed that whenever he stayed at home for several weeks his son grew pale and weak and did not care to eat. Later he noticed again that when he went out of town and stayed away from home for a good while the boy grew merry and strong and as well as ever. This

seemed so strange that he asked the doctor about it. Without any hesitation the wise man told him that the trouble all came from the smoke of the tobacco that he used. He said the boy could not get well unless the father stopped smoking, or unless he went away from home and stayed away. This put the matter so clearly, and the man loved his son so much, that he stopped smoking at once and the boy got well. From that time on he stayed well, and even the father himself was in better health.

If you should walk through a train of cars with your eyes shut, you would know the smoking car by its smell. Indeed, the odor of the tobacco smoke is so strong that even if no one had smoked in that car for weeks, the smell would remain and tell the story. It is also so disagreeable to some people that men who are traveling, and wish to smoke, have to do it in a car by themselves, for even the smell of the smoke sometimes makes women and children car-sick when they travel.

QUESTIONS

1. Describe the robbing of the bees.
2. How did the man treat his greenhouse bugs and worms?
3. What is done with the different parts of a tobacco leaf?
4. How does the first smoke sometimes affect a man or child?
5. What is it in the tobacco that does the harm?
6. Tell the story about the boy and his smoking father.
7. Why do men have to travel in a separate car when they smoke?

CHAPTER IV

HOW THE AIR MOVES AND HOW MUCH WE NEED

Look at the trees when the wind blows, and see the clouds fly. They show that the air is moving fast, and we say, "The wind is blowing." But in the house the

MOVEMENT OF THE AIR

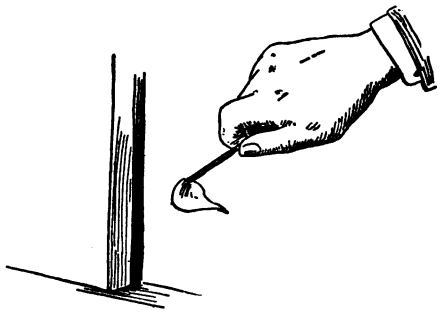
air moves more quietly, though even here the warm air and the cold are always changing places.

Put a soft feather above a lighted lamp or gas jet and see it fly toward the ceiling. Hot air is lighter than cold air, and it gets so very hot around the lamp that it goes up with a rush, taking the feather with it. Soon,

however, the air grows cooler as it leaves the lamp, and the feather comes down again.

Breathe on your hand, and you will see that your breath is warmer than the air in the room. You will know from this that your breath rises, too.

Since all this warm air goes to the top of the room as fast as it can, the air up there must be warmer than it is on the floor. To find out about this, you might set a thermometer on the floor for fifteen minutes and see how high the mercury goes. Now put the same thermometer on top of the bookshelves for another fifteen minutes and look at the mercury again. In winter you will find quite a difference between the two places, for at that time hot air is sent into the room and it rises to the ceiling first.



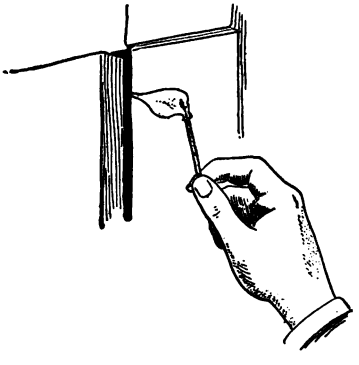
DRAFT INTO THE ROOM

In summer, when the windows are open, there is not so much difference between floor and ceiling air as during the winter.

I stopped my writing just now to make an experiment in the warm room where I sit. I opened the door into the cold hall a narrow crack, then lighted a match and held it close to the crack in the door, near the floor.

Instantly the flame was bent far over into the room. This showed that down there the air was hurrying from the cold hall into my warm room.

Next I held the lighted match against the open crack, near to the top of the door. Thereupon the flame went through the crack and tried to get out into the hall. From this I knew that up there the warm air was going out into the cold hall as fast as it could squeeze through the crack of the door. The whole experiment shows how the air hurries back and forth through any crack it finds.



DRAFT OUT OF THE ROOM

Since the air moves so easily in one direction and another, it is never hard to get fresh air into a house from out of doors, and it is no harder to send impure air out of doors from any room or any house. All we have to do is to keep the matter in mind and arrange for it.

We must also remember that in any room impure air mixes with pure air fast enough to spoil the whole of it in a very short time. We cannot tell the condition of the air by the looks of the room because we cannot see the air itself, but a little experiment with ink and water will help us out.

Put ten drops of ink into a glass of water and it will mix so quickly that you will have rather poor stuff for drinking. Put in fifty drops and the water will be so black that nobody would think of drinking it. This is about the way that impure air from the lungs of fifty children mixes with pure air in a schoolroom and spoils it for breathing. As this mixing goes on all the time, we need to know just how much fresh air we ought to have to keep the whole of it pure enough to breathe.

THIS HOLDS ONE CUBIC FOOT

You might measure something that is one foot long, one foot high, and one foot wide. A box as big as that will hold one cubic foot of air.

Now men who know about it say that, if possible, a child should have two thousand cubic feet of fresh air every hour. This means that, if you could use the box for a spoon, you would have to put two thousand spoonfuls of air every hour from out of doors into the room where you are. More than that, you would have to make room for it by dipping just as much impure air out of the room.

Each child needs as much as you do, and grown people need more. This shows how much air must come and go every hour to supply the fresh air needed in a room full of school children.

In almost every city there are old schoolhouses where the rooms do not get fresh air enough; but in New York City the new schoolhouses are made in such a way that each child has eighteen hundred cubic feet of fresh air every hour.

QUESTIONS

1. What signs show that the air out of doors is moving?
2. What experiment shows that warm air rises?
3. How do you know that your breath is warmer than the air in the room?
4. How can you find out that the air at the top of a room is warmer than the air near the floor?
5. Why is there a greater difference between the air of floor and ceiling in winter than in summer?
6. Describe the experiment with a match at the crack of a door and tell what it proves.
7. What does the ink experiment show about pure and impure air?
8. What does breathing do to air in a room?
9. How big a box would you need to hold one cubic foot of air?
10. How many cubic feet of air does each child need?

CHAPTER V

HOW TO GET FRESH AIR. DRAFTS

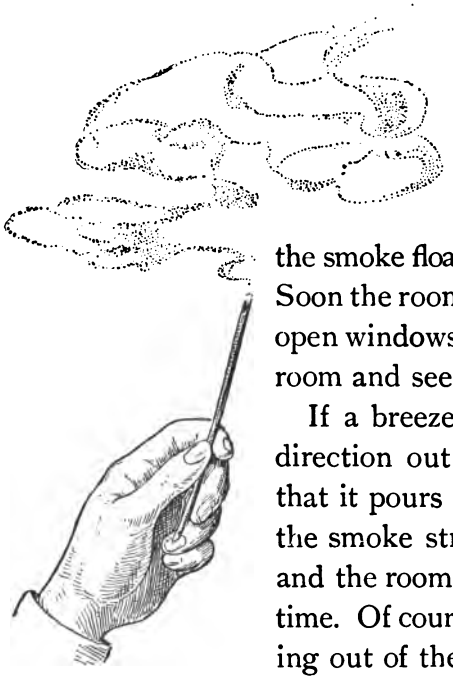
Some people think that we do not need to trouble ourselves about ventilating a room when it is large. They believe that there is air enough in it to last a long time. But this is a mistake. To be sure, the air lasts a little longer in a large room than in a small one; still after an hour or so the people in it need to have just as much pure air come in and impure air go out as if they were in a small room.

Whenever you go into a house from out of doors take special pains to notice how the air smells. Notice it when you first go in, because each one of us gets used to air after we have been in it awhile, and then we cannot tell whether it is pure or impure. If it really has any odor, or if it does not seem pleasant as compared to the air out of doors, you may know that it is not pure.

Do not make a mistake and think that air is impure when it is only warm, for warm air may be pure air too. Sometimes you will have to go by the odor that you find when the room "smells close," as we say.

Yet, after all, the great and useful thing for us to know is just what to do to get pure air in and impure air out of our homes.

If the house is old-fashioned, probably the only way is by opening doors and windows. This is a good deal of trouble sometimes; nevertheless, it must be done. To show how little time it takes to change the air, suppose you shut all the windows of your room and light a joss-stick. See how quietly the smoke floats around here and there. Soon the room is quite full of it. Now open windows on opposite sides of the room and see what happens.



CIRCULATION OF AIR IN A ROOM

If a breeze is blowing in the right direction out of doors, you will find that it pours in at one window while the smoke streams out of the other, and the room is cleared in almost no time. Of course the impure air is pouring out of the room with the smoke, and the pure air is coming in just as fast, though we do not see it.

Stop just here; look around the room you are in and see whether you can tell how the fresh air gets in and how the bad air gets out. You may have to judge by the windows. Notice which are shut and which are open, and see if the wind is blowing; then try to decide

whether or not enough air comes in to supply all who need it.

If everything is shut you are breathing impure air and you ought to do something about it.

Nobody can tell exactly how wide open windows need to be, because all depends on the size of the room

DRIVING AIR OUT OF A ROOM

and the number of people in it; also on the size of the windows and the direction of the wind. When a breeze blows, an opening of an inch or two may be enough, but on a quiet day in summer the windows should be wide open.

Some people think that the hall door will give all the air they need, yet they do not take pains to see that the hall itself is getting outdoor air.

When a room has to get its air from windows, there is always danger from drafts. Now a draft is like a small wind in a room, that is, we say there is a draft when the air is moving fast enough for us to feel it. If a window is open on each side of the room where you are sitting, and if you are between them, you are probably in a draft, and I am afraid you will catch cold.

AIR LEAVING THE ROOM

It is curious, but true, that it is easier to catch cold in a draft in a room than in the wind out of doors, even when that wind is blowing hard enough to break the branches of trees. The reason is that a draft is very uneven. It cools part of the body at a time, and when this is the case the machinery that regulates body temperature does not work well. It does better when the whole body is warm or the whole body cold than when it is warm in one spot and cold in another.

Perhaps the best way with windows is to open them at the top. Then the air blows across the upper part of

the room, and not low down where we are sitting; or one window might be open at the top and another open at the bottom.

In any kind of house a fireplace helps more than anything else to keep the air pure.

Perhaps you are in a house that is heated in the best way. In such houses the heat comes from steam pipes or hot-water pipes in every room. Besides that, fresh air is heated in the basement and pours into each room through a register. Then too, there is a ventilator or a fireplace in each room and the impure air escapes through these.

When heating and ventilating are managed in this way nobody need be anxious to open and shut windows, and there is no danger from drafts.

In your own room to-night decide just what is the best way to supply yourself with fresh air while asleep. Fortunately there is always so much of it out of doors that all we have to do is to give it a chance to get into our rooms. When we let it in by the window at night we must be careful to have bedding enough, and we must never sleep in a draft.

QUESTIONS

1. **How can you tell whether the air in a room is pure or impure?**
2. **In an old-fashioned house how would you get fresh air?**
3. **How is ventilation secured in the room where you are now?**

4. How wide open should the windows be?

5. Can you always get enough fresh air by leaving the door open into the hall?

6. If the door is opened into the hall what else should be done?

7. How can you tell when there is a draft in a room?

8. Why is a draft dangerous?

9. How can you open the windows so that there will be no draft?

10. What is the best way to heat and ventilate a house?

CHAPTER VI

VENTILATION OF THE BUILDING YOU ARE IN

Your teacher will take you to the basement to-day, if she can, and you will see the furnaces, the hot-air pipes, and the fresh-air shafts, — provided a furnace is used.

Be sure to ask questions about anything you do not understand.

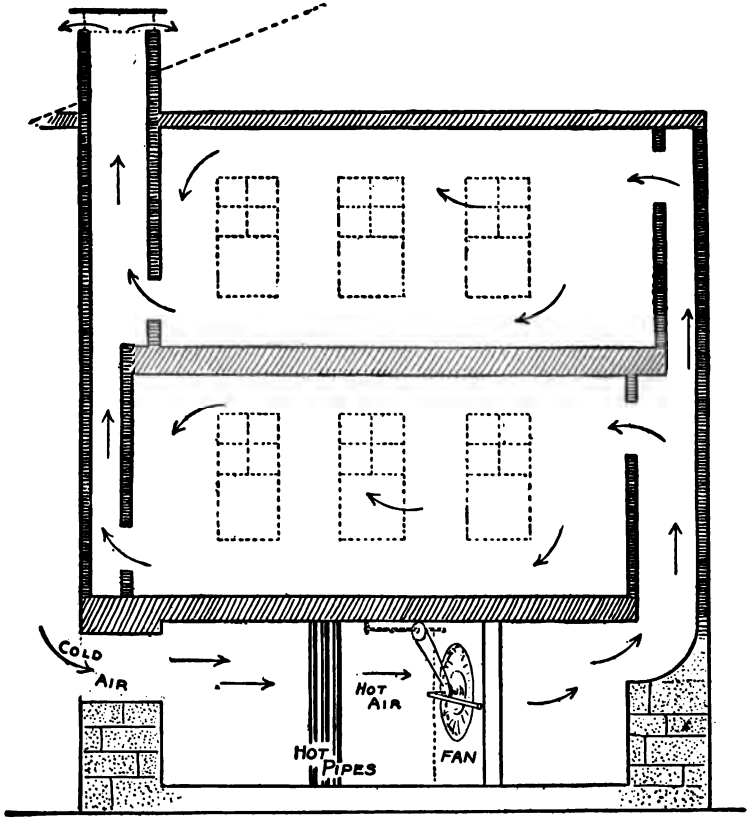
Find out whether the school building is warmed by stoves, by hot air, by steam, or by hot water. If hot water or steam is used, notice whether or not fresh air gets into the building at the same time.

Your teacher will show you how the air comes in at the basement, how it goes up to each room, and how it then enters through the registers. Notice whether there are one or two large registers or several small ones in your schoolroom. Notice the same thing about the ventilators.

If there are no registers and no ventilators, your teacher will tell you how the room is ventilated.

If stoves do the heating, see if windows are open to let the air in, and notice whether they are open at the top or at the bottom.

Decide whether there are any dangerous drafts blowing across anybody.



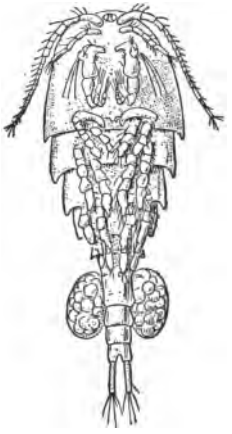
APPARATUS THAT WARMS A SCHOOLHOUSE

CHAPTER VII

A LITTLE LESSON ABOUT LITTLE THINGS. MICROBES

The dot at the end of this sentence is about as big as a water flea looks when we see him without a microscope.

He is indeed so small that when he jerks along in the water we cannot be sure that he has head, tail, or legs. In fact, we hardly notice him at all unless he moves. By looking at him through a microscope, however, we see that he is the fine animal that the picture shows; and now we can study his wonderful swimming legs, his queer tail, his rounded head, and his long, jointed feelers that reach around under his body.



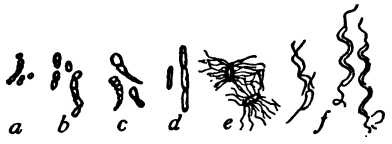
A WATER FLEA
Greatly magnified

Evidently, although our eyes are rather keen for some things, they cannot see everything. There are millions upon millions of tiny living creatures in the world that we cannot even catch a glimpse of without a magnifying glass.

Some of them are plants, some are animals, and we know most of them by what they do. They are so small that the water flea must look like a fearful giant to them,

and perhaps they, in turn, seem to him quite too small to notice; or it may be that he is so much bigger than they are that it is as hard for him to see them as it is for us to see him. Whatever the case may be, and though they are so very small, still we know that some of them can do more harm than mad dogs, while others are more dangerous than whole armies of soldiers in the enemy's country.

They are around us everywhere, — in the air we breathe, in the water we drink, in the food we eat. At the same time they are of so many shapes and kinds that hundreds of men study them from one year's end to the other and learn strange facts about them. They also give them different names, — the yeast plant, the mold, and the bacteria. Some people speak of them all as germs, but the name that fits every kind best is *microbe*, meaning "small life."



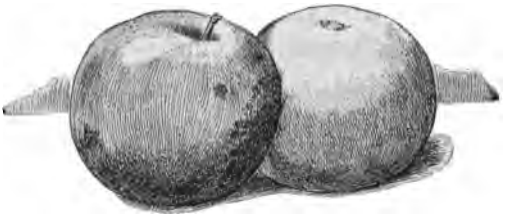
FORMS OF BACTERIA

a, grippe; *b*, bubonic plague; *c*, diphtheria; *d*, tuberculosis; *e*, typhoid fever; *f*, spiral types.

Most microbes do us neither harm nor good. Multitudes of them are indeed the best friends we have, yet very many others are our worst enemies. It is the microbe that spoils our meat and sours our milk and gives us moldy bread. They rot the fruit after it is picked, and turn sweet grape juice into wine and vinegar. In all this they are so successful that we might call a piece of spoiled meat or fruit a microbe city,

for millions of microbes are living there together and working as fast as possible. They are also ready to go from such a city to a new place, and there the new colony grows fast.

Take a sound apple and a rotten apple. Crack the skin of the sound one, press the rotten one against it, and leave them close together for a few days; then examine them and you will see that even the sound apple has begun to spoil. A few microbes promptly went across from the rotten to the sound apple and made their home there. After that nothing can save an apple except to cut off every bit that is spoiled; but even then it will not keep long, for the skin is broken and other microbes from the air can get into it easily.



WHERE MICROBES MAY CROSS

This is true of every kind of fruit, and also of meat and milk, in fact, of anything that can decay. Microbes move fast and they start new homes in whatever is near by. Cooks who know this are careful to protect their food from microbes if they can. They never put fresh meat near meat that is spoiling, nor new milk into a pitcher with old milk.

Cooks also know that microbes work fastest in warm places and slowest where it is cold, and for this reason, when they want milk to sour in a hurry, they put it in a warm place; when they want it to keep sweet, they put it in the ice chest. They know that it will surely keep if it is frozen. They also know that meat, if it is frozen solid, will keep long enough to be carried to the North Pole and back again, though on a warm summer day, in a hot kitchen, it may begin to spoil in a single afternoon.

To understand this we must know that microbes do not die when they are frozen. Instead, they can endure more cold than the strongest man. It is true, of course, that while they are frozen they can do no more work than a frozen man, but the difference is that when the freezing is over the man is dead, while the little microbe is as sprightly as ever and ready for business.

Since they are so plucky about cold, it seems as if they ought to endure great heat too. Yet this they cannot do, for fire, or water that is boiling hot, actually kills them. This then is our good fortune, for we manage to save some of our food by boiling the microbes that get into it.

There are two sides to the secret of keeping things from spoiling:

1. Kill the microbes.
2. Put the food where no microbes can get to it.

All this tells about our food,—how it spoils and how to keep it sweet. But you and I are far more important. We send microbes into our lungs every day with the air we breathe; we put them into our mouth with our food and our drink; we gather them on our hands and our face from anything we touch. Though many of these microbes do us good, some of them do us great harm. They may give us sore eyes, typhoid fever, consumption, or any one of a long list of other diseases that make us miserable, put us to bed, or kill us outright. They are the smallest and the strongest enemies we have, and we need to know how to protect ourselves against them.

QUESTIONS

1. What instrument does a man use when he studies microbes?
2. Where do microbes live?
3. Do they help us or do us harm?
4. What do they do to milk, meat, fruit, and other things?
5. Describe what happens when you put a rotten apple against a sound one.
6. Do microbes work faster in cold or warm places?
7. What does freezing do to microbes?
8. Why do we boil fruit and vegetables before we can them?
9. What is the secret of keeping things from spoiling?
10. Can you mention any disease that microbes give?

CHAPTER VIII

MICROBES AND KEEPING CLEAN

Last winter, in the town where I was staying, there were large red cards fastened to the houses on almost every street. More than that, on each card there were seven letters so long and so black that people who walked on the opposite side of the street had no trouble in reading the word "measles." Everybody also knew what the sign meant, for it was as if the doctor had called aloud: "Measles are in this house. If you come in here, you will be in danger. You 'd better stay away."

After the sign had been put up, I noticed that the neighbors obeyed the warning, for very few people besides the doctor himself went in and out of the house.

The fact is that the air in places where people have had certain diseases contains so many microbes of that disease that we are never willing to breathe it if we can help it. We are also most careful not to touch the people themselves, for we know only too well that microbes go as easily from a sick child to a well child as from a rotten apple to a sound one. It is a more serious matter, too, for the child; for though we can cut off a piece of apple that is getting rotten to save

the rest of the apple, still it would be rather hard to cut off a piece of a child for the sake of saving the rest of him! It is easier and pleasanter not to let the microbes get a start in the first place. Children do, however, save themselves from a good deal of danger every day.

I sometimes wonder what a room full of children would say if I should ask them why they try to keep clean. Perhaps one would answer, "Mother makes me." Another might say, "I hate dirt"; and another yet, "Nobody likes me when I am dirty." These are pretty good reasons, although the teacher in the same room would probably say, "I keep clean because I want to keep well"; and this, in fact, is the most important reason of all.

Hands and faces and clothes that are not clean have more microbes on them than clean hands and faces and clothes. I wash my hands before I eat because, if I do not wash them, the microbes will go from my fingers to my bread or to anything else I touch. They will enter my mouth with my food, and I shall swallow every one of them. If disease microbes are there, they will go down just as easily as the others, and they may give me great trouble afterwards.

As we go from place to place in the city every day our hands touch things that other people have touched, and we do not know who those people were. We grasp the iron railing of a car to keep ourselves from falling

but we never suspect that a person with some kind of disease microbes on his hands may have just let go that same rail and left his microbes there.

We push a shop door open with both hands; yet who knows what sort of person with what sort of disease may have pushed it open two minutes before we came? Thus in a hundred ways we may gather up the worst of the city microbes. We may then reach home barely in time for dinner and, if we forget to wash our hands, we give all sorts of microbes from all sorts of people the chance to go into our mouths with our food.

WHERE MICROBES MAY BE EXCHANGED

Wearing gloves is quite a help, although even those who wear them are sometimes very careless. I have seen a gentle-looking, well-dressed woman with gloves on slip a penny between her lips for a moment. It was a dangerous thing to do, because who could tell what hand had held the penny before she held it, or what kind of microbes might be on it?

If her lips had been cracked or chapped, and if the microbes on the penny had been of the dangerous kind, she might have caught a dangerous disease. Lips that are slightly cracked are like apples that have their skins broken; if disease microbes get against them, they settle there at once and cause trouble.

We must not forget that most microbes are harmless, but we must be sure to remember that some of them do us such great harm that the safest thing is not to run any risks. It may be that the well-dressed woman whom I saw had never heard of microbes, for some people are quite behind the times in this matter.

Clothes need to be clean as well as hands, — also houses, schoolrooms, cars, and churches. The cleaner such places are, the safer we shall be; for wherever people live or go, wherever they breathe the air or die, there we are likely to find things that are soiled and microbes that are multiplying. Since we know all this we must try to keep clean every day; we must live in clean houses for the sake of keeping well.

QUESTIONS

1. What does a warning sign on a house sometimes seem to say?
2. Why are we careful not to touch certain people?
3. What is one great reason for washing our hands and keeping clean?
4. How may microbes get from the hands to the mouth?
5. Mention ways in which microbes may be exchanged?

CHAPTER IX

DUST AND CLEANLINESS

When the wind blows, clouds of dust whirl down the street, and it seems as if you could hardly draw your breath.

You turn your head away, press your lips together, and try not to breathe much, even through your nose; yet, in spite of all that, so much dust is in your mouth that you almost taste it, and so much is in your eyes that they ache and grow red. Tears run down your cheeks even though you are not crying. You cough and use your handkerchief, and after you reach home you may feel as if you had caught a hard cold.

There is reason for this, for many kinds of dust have edges and corners and rough sides. A speck of coal dust from the engine really scratches the delicate inside skin of the eye with its corners, though the hands and face cannot feel them. As for the lungs, they are so much more delicate that even ordinary dust in an ordinary home is bad for them.

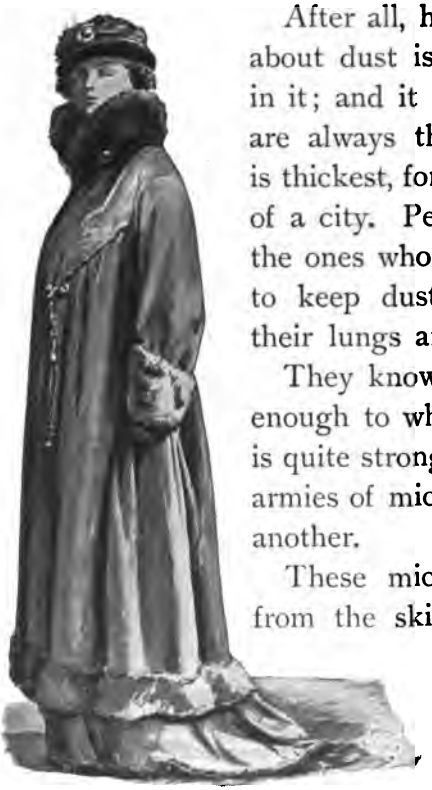
If you want to know whether or not there is dust in the air you are breathing, look at a band of sunshine as

it streams in through the window. In almost every room, in this sunshine, you will see hundreds and thousands of dust-specks that look like tiny air ships floating up and down on the sunbeam, — fairy ships of shining gold.

A Dust Storm

Now pick up a corner of the rug and shake it, or draw a heavy curtain back and forth on its pole, and look at the band of sunshine again. Suddenly the little fleet is ten thousand times as big. Thousands and thousands of those air ships are crowding each other and racing on the stream of sunlight. It is a beautiful sight, although,

of course, it is not good for any pair of lungs to inhale such air as that. We must remember that dust is just as thick everywhere else in the room as it is in the sunshine.



OLD-FASHIONED SKIRTS STIRRING UP DUST AND MICROBES

After all, however, the worst thing about dust is the microbes that are in it; and it is easy to see that they are always thickest where the dust is thickest, for instance, in the streets of a city. People who know this are the ones who take the greatest pains to keep dust and microbes out of their lungs and out of their homes.

They know that any wind strong enough to whirl the least dust along is quite strong enough to carry whole armies of microbes from one place to another.

These microbes get into the air from the skins of people who have skin diseases; they are blown by millions from every heap of dry rubbish that you see, from garbage cans and sewers, from dead animals and soiled clothes. In fact, they multiply fastest in unclean places.

Microbes that give consumption are thick in the saliva of men and women who have that disease. These people are often careless. They spit on the street, where the saliva dries after a while; passers-by step on it and crush it; ladies brush it around with their skirts; it gets into the air; the wind blows it through our streets into our homes and our schoolhouses; it settles in our carpets and our curtains; we breathe it into our lungs, and if we are not very healthy the microbes stay there and end by giving us the disease itself.

This is such a dreadful prospect that some cities have made laws against spitting in public places. Some people still do it, however, and that is why we should not breathe the dust in the street, and why we should banish it from our schoolrooms and our homes.

Nevertheless, in spite of all we can do, it will get in sometimes; then comes the important question of dusting. Some people have a queer way of doing it. I have seen them go round switching things with a feather duster. The dust flies up at once and floats in the sunbeam, while the woman herself breathes it until it settles down again. If the windows are open some of it gets out of doors; otherwise it stays here and there in the room. It is scattered, that is all.

A soft, damp, dusting cloth is better than a feather duster; but if this is likely to injure anything, use a dry cloth and shake it out of the window very often.

In a certain school in Worcester, Massachusetts, there is what they call the "Health Brigade." Here the children take turns in wearing the uniforms and in doing the dusting. They wait eagerly for their turn to come around, and they keep the rooms so clean with their damp dusting cloths, that in 1902, when they did their work, fewer children were ill than ever before since the beginning of the school.

Damp dusters and school children did better work in that school building than feather dusters and janitors.

QUESTIONS

1. What happens to people caught in a dust storm?
2. Why does dust in the eyes start the tears?
3. How can you see whether or not there is dust in the air of a room?
4. If it is thick in the sunshine, what do you decide about the whole room?
5. Why should rugs be shaken out of doors?
6. What is the worst thing about dust?
7. How do microbes get into the air?
8. Why is there a law against spitting?
9. What is the best way to dust?
10. Tell what the "Health Brigade" of Worcester did.

CHAPTER X

TOBACCO CHEWING AND CLEANLINESS

Last winter, on a very cold day, a friend of mine met a farmer who had just driven in from the country, and he saw a brown icicle a quarter of an inch long hanging from each end of his mustache. It did not make the man look handsome, and it showed what he had been doing.

Several years ago I knew an old man who had been quite a dandy when he was young, but even then he chewed tobacco. He was so careful and neat about it, however, that no one thought he did it for a moment, not even the woman he married. Still as he grew older he grew careless too, and when I knew him he was such an untidy old man that he showed every one of the chewing signs. His dreadful tobacco breath matched the looks of his few wretched teeth, and the stains on his shirt front looked as if they came from the brown edges of his twisted mouth. An old man who is not tidy is certainly one of the most unattractive things on earth.

A plug of tobacco is brown and dry, and it is pressed into a square, hard block which men carry around in their pockets. When they hold it in their hands or bite off a piece it does not look as if it could do any more harm than

a piece of chocolate; but thousands of young men have grown into untidy old men because they have used it.

The places where they do their chewing are no cleaner than the men themselves. Indeed, they match them exactly. Ask your father to take you to such a place for a moment sometime. Perhaps it will be a crowded room in a city, or a country station, or a back-alley store. Wherever it is, look at the floor. In such places you will see great damp spots which tell the story at once. Men who gather in such places generally use tobacco, and everybody knows that men who chew have to empty their mouths constantly. The tobacco makes them do it. For this reason, wherever a tobacco chewer sits or stands, there you see the signs of his occupation. The floor shows it and the spittoon shows it, though the man himself is not often ashamed. Ladies who walk that way have to hold up their skirts to keep them clean, but he keeps on with his untidy work of spitting tobacco juice.

There is one great difference between the man who chews his plug and the cow that chews her cud. The cow is neat and clean about it and the man is not. The cow does not soil the floor or use a spittoon; she has no brown spots at the corners of her mouth and her breath is sweet and clean.

Spitting is so disgusting that even the word itself is disagreeable and we hate to use it. Still there is no other word that is quite so easy to understand.

A few years ago those who used tobacco were a nuisance everywhere. No law had been made to check them, and people who wanted to keep clean put spittoons in every public place, — in railroad stations and business places, in beautiful homes, in the House of Representatives, in the courthouse where the judge sat, and in the jail where the prisoner went. There were spittoons all over America, and every one of them was untidy; yet for years this was all that could be done.

Some people do not understand why you and I object to their use of tobacco and they think that if they need to empty their mouths very often, we should not try to stop them. The truth is that we object to the man and to what he does because we cannot keep the air clean when he is around.

Our chapter on Dust and Cleanliness explained this. Often a spittoon is tipped over, and what is left on the floor dries after a while. It is trampled on, turned to powder, blown into the air, and you and I cannot help ourselves; we have to breathe it. We have to take into our clean lungs the dried tobacco juice that has come from the mouth of the unclean tobacco chewer.

At last, however, some cities have passed laws against spitting. Better yet, these laws are printed in large letters and pasted up in railroad stations and in electric cars, so that now people cannot empty their mouths everywhere whenever they please. In New York City

men are fined or put in prison for spitting on the floor of trains and stations and other public places.

What I am going to tell you now is n't very important, but it is interesting. There are tribes in Africa that eat their enemies if they get a chance, but I have been told that these cannibals do not like the flesh of a man who has used tobacco. They say it has a dreadful taste. Perhaps it tastes as his breath smells. It is not necessary for us to know this, for there are no people in America who eat human flesh.

QUESTIONS

1. What are some of the signs of a tobacco chewer?
2. As the tobacco chewer grows older does he seem to grow more tidy or more untidy in the way he uses tobacco?
3. How does a plug of tobacco look?
4. Why do we object to having a man chew?
5. What have some cities done about spitting?

CHAPTER XI

WHY AND HOW WE NEED TO SLEEP

Once in a great battle on the river Nile some British soldiers had to be awake so long and work so hard by day and by night that at last some of them fell asleep on the deck of the ship in the midst of the fighting.

They wanted to keep awake and they tried not to sleep, but they could not help themselves.

In another battle the captain of a man-of-war fell asleep too, and the strange part of it was that although a great cannon was firing all the time only six feet away from him, he slept two hours and did not hear a sound.

Soldiers have done even stranger things than that. They have fallen asleep while they were marching along, and they have walked several steps while they were asleep. Of course, they wakened very soon, but they did march and sleep at the same time.

Children who work in factories often have just as much trouble about keeping awake when they are very tired. They try with all their might not to go to sleep while they are working, because they know they will be punished if they do; but suddenly, before they know it, they are fast asleep.

Now the soldiers, the captain, and the children all had the same trouble. They had worked too hard and slept too little; the brain was tired out, and under such circumstances it sometimes goes to sleep even when we tell it not to. Whenever we say we are sleepy we mean that the brain needs to rest.

Ask your father to open and shut his hand as fast as he can, and beg him to keep on doing it as long as he can. After a while he will tell you that his fingers are stiff, and you will notice that they move more and more slowly. Then he will say that he is getting very tired. If he keeps on long enough, at last his hand will be so tired that his fingers will not obey him. They will not move even if he tries with all his might to make them. The brain behaves in just this way when it is very tired; it cannot keep on working even if we want it to.

We all know that thinking is the work that the brain does. It begins when we first wake in the morning, and it does not stop until we go to sleep at night. It does not rest an instant all day unless we take a nap; for from first to last it is thinking about toys and play, about school and kites, dolls and balls, and all about our duties and our fun. No wonder it gets tired. No wonder we have to sleep a great deal to give it the rest it needs.

The truth is that we spend more time in sleeping than in eating or playing or studying; and we are wise in this because the work the brain does is more important than

the work of any other part of the body, and sleep is the only thing that rests it.

If you lie down and are not asleep, the brain is not really resting. If you dream, it is working a

TOO TIRED TO STAY AWAKE

little; but it rests perfectly when you sleep perfectly.

While the brain stops working the rest of the body is not idle. In fact, one of the important things to remember is that children grow fast while they are asleep.

You can prove this by noticing how much a baby sleeps and how fast he grows.

If you have a chance, you might visit the same baby once a month for a year. Each time you will see that he is bigger. His mother will also tell you that he does nothing but sleep and eat, and from this you know that he must be growing fast while he sleeps. It is a fact,

A Good Position for Sleeping

indeed, that babies who sleep the most grow the fastest, and, as a rule, this is true of all children.

Though we can sleep even when we are not lying down, still we get the best rest when we are stretched out on a comfortable bed.

Several things about the bed must be looked after. It should be flat and smooth. The pillow should not be large, because the higher the head is raised the harder the heart has to work to send the blood into it, and we ought to give the heart as little work as possible at night.

Some people use a thin hair pillow, and others who are quite as wise use none at all. Most people understand the laws of oxygen and carbon dioxide so well that they never cover their heads with the bedclothes when they sleep. They wish pure air and plenty of oxygen instead of impure air and little oxygen under the bedding.

While we are sleeping we have a grand chance to help decide whether our backs shall be straight or crooked. If we always lie as we should we shall be helping our backs to be straight, because children's bones are not very hard, and the oftener we bend them in one particular way the more likely they are to stay in that shape. But a boy who is sure that he wants a straight body will help himself even while he is asleep, and when he has grown to be a man he is sure to be as straight as a soldier.

QUESTIONS

1. What happened to tired soldiers on the river Nile?
2. What happens sometimes to tired-out children?
3. Why do people sometimes go to sleep when they don't wish to?
4. What sort of work does the brain do?
5. When does the brain rest?
6. Why do we need to spend more time in sleeping than in eating, playing, or studying?
7. What does the body of a child do while he sleeps?
8. In what position can we sleep the best?
9. Why should the pillow be low?
10. Why do we leave the head uncovered?

CHAPTER XII

SOME RULES ABOUT SLEEPING

Sleep is so important that when a man is ill the doctor often tells the nurse not to waken him even for his medicine or his food. He says that sleep will do him more good than anything else.

A doctor in Stockholm, Sweden, studied the health of children and found that those who did not sleep enough were ill the oftenest, while those who slept the most were generally the healthiest. It is the same with children in other countries.

Ask the members of your class about it, and I think you will find that the ones who read and spell and learn their lessons best are the ones who sleep the most. You might see what they say about it. Perhaps you have noticed that you yourself are always happiest and bravest and kindest, that you learn your lessons the easiest and recite them the best, and that you have the most fun with games of all kinds after you have slept well. It is so with everybody; we do everything best after we have slept best.

But there are some people in every town and city who cannot sleep much, no matter how hard they try.

I knew a woman once who had only slept five hours that week, and she said nobody knew how she suffered. When she did sleep again she was the happiest woman you ever saw.

There are certain things that help many people to go to sleep. The patter of rain on the roof is one, the rustle of leaves is another, and the gentle singing of a lullaby is still another. All these things help because they keep on without much change. They are what we call monotonous. The sound goes on in the same tone, and it is soothing. But when the sound stops the people waken at once.

Perhaps you have seen how quickly an old man stiffens his neck and sits up straight when the minister stops preaching. It is the same with a baby too sometimes. He sleeps while the nurse is singing, but when she stops he wakens and begins to cry.

People know that monotonous things make them sleepy, so when they are excited or tired and cannot sleep they try all sorts of schemes that are monotonous. Sometimes they count slowly from one to one hundred; then they count backwards from one hundred to one. Sometimes they repeat a verse of poetry over and over again, or they say to themselves, "Sleep, sleep, sleep," until at last they go to sleep.

Once when I could not sleep I learned to say the alphabet from both ends to the middle, like this: a z b y c x d w e v f u g t h s i r j q k p l o m n. At the same time

I learned to say it from the middle out again, like this: m n l o k p j q i r h s g t f u e v d w c x b y a z. That seems a foolish business now, but it helped me to go to sleep many times in those days.

Children do not lie awake very often. For them the principal questions are when to go to bed and how long to sleep. Or we might put it this way: if a man or a child wants his brain to work for him in the best way it can, and as fast as it can, how many hours ought he to sleep each night? Merely to be in bed is not enough.

Babies need more sleep than young men, and people who are feeble need more than those who are strong. From this we see that there can be no very definite rules. Here are some pretty good ones, however.

1. Children four years old need to sleep about twelve hours.

2. Children seven years old need to sleep about eleven hours.

3. Children eight and nine years old need to sleep about ten and a half hours.

4. Children ten and eleven years old need to sleep about ten hours.

5. Children twelve years old need to sleep about nine hours.

Even grown-up people are healthier as a rule and can use their brains and bodies better when they sleep seven and a half or eight hours a night.

By using this table you ought to be able to decide for yourself how many hours of sleep you need each night. Notice whether you are wide-awake or sleepy when it is time for you to get up in the morning. If you are sleepy, you must go to bed earlier; you need more sleep, and the time to get it is in the evening, not in the morning.

Probably you are nine or ten years old. In this case you ought to sleep ten hours or more every night.

If you are healthy and strong, and if you are wide-awake in the morning so that nobody has to waken you for breakfast, then perhaps ten hours will be enough. Let your father decide about that.

I know three children who go to the grammar school. They are about the best scholars in their classes, but they never have any "home work" to do. They do all their studying in the schoolroom. When they are not in school they are generally playing out of doors in the pure air. One reason why they get along so well without doing "home work" is because they sleep so much.

Elizabeth is nine years old. She sleeps ten and a half hours almost every night. James is eleven, but he is strong, and after he has slept nine and a half hours he is wide-awake. He cannot sleep any more and his father lets him get up. Fred is thirteen. He is not quite so strong as James, so he sleeps ten hours and he is getting stronger every month.

All three children are healthy, and are growing fast; they are good students and they are full of fun too. They think that sleeping is like putting money in the bank of health. I think so too.

I shall now give you three rules.

1. Sleep all you can. This will make you brighter and bigger.

2. Go to bed and get up at regular hours. This will help you to get sleep enough.

3. Unless you are ill do not lie in bed many minutes after you wake in the morning.

QUESTIONS

1. What does a doctor sometimes advise about sleep?
2. What did a doctor find out about school children in Stockholm?
3. What do your classmates say about sleep?
4. When do you feel best, after much or little sleep?
5. What sort of things help to put people to sleep?
6. If a child or a man wants his brain to be as useful as possible, what important thing must he see to?
7. According to the rules, how many hours' sleep do you need every night?
8. Tell about the three children who slept so much and had no "home work" to do.
9. Give the rules of sleep that end the chapter.

CHAPTER XIII

HABITS OF SLEEPING

Next door to where I am sitting and writing there is a little girl seven years old. She cannot go to sleep unless her mother sits in the room with her and unless the gas is burning. If her mother is not there, she lies awake and screams.

Just across the road in another house is a boy five years old. Every evening when bedtime comes his mother says, "Now for bed." Generally he looks unhappy because he likes to play; but he trots along. His mother puts him in bed, tucks him in, says good night, turns out the gas, and goes away, and in five minutes he is fast asleep. He never lies awake to scream for his mother, and he cannot sleep if there is a light in the room.

Some mothers hold their babies, and rock and sing them to sleep. They do this so regularly that after a while it turns out that such babies cannot sleep unless the mother does hold and rock and sing to them. Other mothers put the baby into a comfortable bed, give him a little pat, smile at him, and go away; and these babies fall asleep just as soon as the others. It almost seems

as if there must be different kinds of babies in different families. But this is not so; the real secret of the sleeping is that we get used to things and then we find it hard to change.

That is why the little girl next door needs her mother and the light to help her sleep. She is used to them. It is the same with the boy, with the baby that needs to be rocked, and with the baby that goes to sleep quietly on the bed. Their mothers have trained them, and each has his own particular habit. Older people train us when we are babies, but when we grow older we must train ourselves.

You might try this plan. Go to bed every night at exactly the same hour and see whether you don't fall asleep more quickly each night.

Captain Barclay was a man who walked a thousand miles in a thousand hours. Of course every moment was precious and he did not want to waste any time getting to sleep. So he trained himself until he found that he could fall asleep the moment he lay down. As soon as he wakened he began walking again.

We can help ourselves to waken in the same way. In some families the first thing you hear in the morning is a loud call at the foot of the stairs: "Children! Children! It's time to get up." Then after a while somebody says: "I don't see what's the matter with those children. I suppose I must go up and shake them all out of bed."

Some children have to be spoken to and shaken and called over and over again before they are awake enough to get up. Other children waken at the first call and get up without any trouble. Perhaps one child has not slept enough, but very often the real reason is that they have different habits of waking. If any one gets into the habit of hearing the first call and getting up at once, he will always hear it; but if he pays no attention to it, and stays in bed, and takes another nap, after a few days he will not hear it at all.

FORMING A HABIT

It is easy for any man, woman, or child gradually to form this habit. I have done it myself.

Every winter when our man Crosby goes to the basement and shakes the furnace with all his might for the first time, I waken with a jump and think that the world is coming to an end. Then I remember what is happening and go to sleep again. The second morning I am not so frightened, and I fall asleep at

once. The third morning I only half hear the noise in my dreams, and after that I sleep through all his shaking and poking without so much as turning over.

Now if I had stayed awake those first few mornings, I should have started the habit of waking at five o'clock, and this would have kept me miserable all winter; but instead, I made myself go to sleep, until now that is my habit and I like it. I trained myself to it.

It is the same with an alarm clock. If you go to sleep again each time after the alarm has sounded, in a few mornings you will train yourself not to hear it at all. In that way children train themselves not to hear the first call to get up. If they have slept long enough, they ought to get out of bed at once. Still, all I am trying to show just now is that we can make our own sleep habits. We can train ourselves in the opposite way too.

If we heed the alarm clock, and stay awake, and get up, it will always awaken us.

It is strange, but we can train ourselves to hear some noises and not to hear others. The things we attend to are the ones that awaken us. A good nurse may sleep through a thunderstorm, or a dreadful fire alarm, but when her patient groans, or when she only whispers her name, the nurse wakens in an instant. She has trained herself to listen to that one particular sound.

Some people are trained by the place where they live. I have a friend who cannot sleep when she goes to the

country. She said one day, "You see it is so awfully quiet out here in the country, that it keeps me awake." In Boston she sleeps soundly, but her home is on a noisy street. She misses the noise just as a baby misses his mother's singing.

A man once lived near a noisy mill that ran at night, and after a while he could not sleep unless the mill wheel was going.

It is the other way with most of us. We need the quiet for our sleep. When country people go to the noisy city it is often many nights before they sleep well.

From all this we learn that after doing a thing in one way for many times something within us seems to decide that we shall do it in the same way every time. That is why it is so important for us to start our sleep habits in the right direction.

QUESTIONS

1. Describe the different ways in which children go to sleep.
2. What is it that makes the difference?
3. What did Captain Barclay train himself to do?
4. What difference is there in the way children waken?
5. Why do some children waken promptly while others have to be called over and over again?
6. How can I train myself to sleep?
7. How can I train myself to waken at the slightest sound?
8. What is a good nurse able to do about waking and sleeping?
9. Why should we have good habits of sleep?

CHAPTER XIV

DANGERS TO THE EYESIGHT

If any one should ask what you considered the worst thing that could happen to you, you might say blindness.

Think what it means, — to lose the sunlight, the sky and the clouds, the birds and the flowers! Never to see the faces of friends again; never to see kites fly, or dolls shut their eyes; never to be able to read, or play ball or top, or skip rope!

Words could not tell our loss, yet blindness comes suddenly sometimes.

To be sure, there is the bony eye socket like a mountain range around the eyeball to protect it; and it is true that it stands guard like a faithful sentinel by day and by night; nevertheless, every Fourth of July of every year toy pistols and cannon firecrackers blow their way past the sentinels and bring darkness to hundreds of shining eyes.

Scissors, knives, and sticks in careless hands do the same thing. A college student friend of mine even fell on a barbed-wire fence in such a way that a sharp point pierced the eyeball. Since then neither darkness nor daylight has made any difference with that eye. It is stone blind.

HE CANNOT SEE

On the Fourth of July and every other day let our watchword be "Carefulness." Toy pistols and cannon firecrackers should never be used. Remember that a ruined eye will never grow again.

Bones are not the only guardians of the eyeball, for there are the eyelids besides — the most wonderful curtains in the world.

You do not have to pull a string, or lift a latch, or give a command to make them move. On the contrary, they act as if they did their own thinking. If dust blows, the curtain drops low and the fringe of the eyelash falls in such a way that you can peep through it even while it keeps the dust out.

EYELASHES THAT KEEP THE DUST OUT

If any light is too bright, the curtain slides down just far enough to let in what you need; if you are sleepy, it shuts down so tight that not a ray of light can get in; while if anything comes quickly toward your open eye, the curtain falls like a flash to protect it.

Think of your eyelids for a moment. Guess, if you can, how many times they rise and fall every minute. They never grow weary; they are always diligent and they teach us that even light itself should be kept out sometimes.

I have never seen an eagle gaze at the sun without winking, although I have heard that he can do it. Not so

with us, however. Tears come to our eyes and we grow dizzy when we try the experiment. These signs prove what harm a very strong light does. Japanese mothers do not know this, I suppose, for they carry their babies as if they thought they had the eyes of an eagle.

When a Japanese baby falls asleep strapped on his mother's back, the small head bobs over backward, the face is turned toward the sky, and sunshine streams down on his eyes. Doctors think this is one reason why so many people in Japan have trouble with their eyes.

JAPANESE BABY ASLEEP

Notice the first baby carriage you meet on the street. If the sun is shining, the cover should shade the baby's face, and should have a dark lining to keep out as much light as possible.

Babies should not gaze at a bright sky, at a window that is very bright, at a lighted lamp, or at the fire in the grate. Even we ourselves should not do these things for any length of time. A shade over our eyes when we read in

the evening, or a shade over the lamp, will keep the light out of our eyes and throw it on our work where we need it.

Yet there is the opposite danger of too little light. Thousands of women ruin their eyes by sewing in rooms that are too dark, while thousands of both men and women injure their sight by reading in the twilight or by dim lamps. It is not safe to do these things. Eyes are too precious to be strained either by too much or too little light.

SHADING THE BABY'S EYES

After all, however, the greatest danger to children's eyes is from microbes. Indeed, some of these microbes can do as much harm as a Fourth of July explosion.

Several years ago, in a certain European city, there was a great epidemic of eye disease. The first anybody knew about it was that thirteen children in one schoolroom had the trouble. Then it went from room to room and from schoolhouse to schoolhouse until four thousand children were suffering in that one city alone.

The same disease is found in other cities in different parts of the world, and it always spreads if it gets a chance.

One of these eye diseases is so terrible, and it spreads so fast, that the government of the United States is very strict in trying to keep it out of the country. For this reason there are officers that examine the eyes of every immigrant who wishes to land. If then any man, woman, or child has that particular eye trouble, the officers either send him back at once to the country he came from, or else they see that he is cured before they let him go around among other people.

THROWING LIGHT ON THE BOOK

It is the easiest thing in the world for children, through their ignorance of microbes, to help eye diseases along. One child may have sore eyes in the first place. They feel queer; he therefore rubs them and gets microbes on his hands. Next he takes hold of the hands of other children, or of some book or plaything that they are going to touch, and microbes are left in those places.

Later yet, the well children touch those books and playthings, get those same microbes on their hands, rub their eyes, and leave the microbes there to go to work at once. The only place where these special microbes can do harm is in the eye.

In this way disease microbes may be passed from eye to eye and from schoolhouse to schoolhouse, until there is an epidemic.

In some schools the children all wash in the same bowl and wipe their hands and faces on the same towel. This is most unfortunate, for nothing helps eye disease to spread faster. Always be careful not to use any water or wash cloth or towel that any one else has used. Use paper towels whenever they are supplied.

Teachers are more particular about such things than they used to be. They know the danger, and when they see children with red eyes, or when they notice that the edges of their eyelids look rough and sticky as if they had been fastened together by something, they either send the children to a doctor at once, or send them home lest they communicate the disease to the other children.

"Pink eye" goes in just this way from child to child. It also travels so swiftly that if the first child who has it is careless a whole room full of boys and girls may soon be afflicted by it. He who has "pink eye" should therefore be as thoughtful for others as for himself.

If the doctor says that you have any sort of eye disease, you must be as careful as possible about two things.

1. Don't rub your eyes with your hands.
2. If you have put your hands to your eyes, don't touch anything that other people may touch afterwards until after you have washed your hands.

If others have sore eyes and you want to escape, be careful about two things.

1. Never touch anything they have touched.
2. If you have touched those things, keep your hands away from your own eyes afterwards.

QUESTIONS

1. What pleasures should we lose if we could not see?
2. What is the use of the eye socket?
3. What sort of accidents happen in spite of the eye socket?
4. What does the eyelid do?
5. How should we protect the eyes of babies?
6. Is it possible for our eyes to receive too much light?
7. How can we save our eyes from too much light?
8. How do people ruin their eyes by too little light?
9. What does the greatest harm to children's eyes?
10. Describe the eye epidemic in Germany.
11. How do school children give eye disease to each other?
12. If you have the disease, what will you do to save others?
13. If others have the disease, what will you do to save yourself?

CHAPTER XV

READING, BOOK PRINT, AND GLASSES

If a carpenter is hammering nails into the wall, or if a shoemaker is sewing leather to make a shoe, it does not matter very much how the light falls, because his work is so big that he can see it well enough in any part of the room; but if a man is writing a lecture, or if a boy is studying his lessons, it makes very much difference where the light comes from. People who use books and pens every day have to be specially careful about the way the light shines on their work. Look around your schoolroom and see where the light is brightest. Every house gets its light either from daylight through the windows — which is the very best to use — or from lamps,

BOOK IN THE SHADOW

gas, or electricity; but whichever kind of light it is, the way it slants toward our book or our work is a matter of great importance to the eyes themselves.

Take a book, stand with your back toward the window, and try to read. Your shadow falls all over the page and makes it almost as bad for your eyes as if you were in a dark room.

LIGHT IN THE EYES

Now turn squarely around and face the window. This is uncomfortable, too; because if you hold the book slanting upward, as you ought to do, the page is in the shadow again, while the bright light is in your eyes. Of course this is as wrong as possible. Try again.

Stand with your right side toward the window. This is quite fine, you think; the light is on the page and your eyes are in the shadow. Yes, that is very well for reading; but if you were writing, the shadow of your hand would fall across the page and bother you a little. Put your hand up as if you were writing on the page, and see what I mean.

There is just one other way. Stand with your left side to the window. Now everything is perfect for reading and for writing too. The light shines on the white page; it is reflected up to your eyes and you see the words easily. You do not face the light, and if you are writing, the shadow of the hand falls where it does not cover anything.

LIGHT OVER THE RIGHT SHOULDER

Whatever kind of light is in the room, the rule about the right way to sit is always the same. Desks should never face the window, and blackboards ought to be opposite the windows and not between them. This not only saves the eyes from being dazzled but makes it easier to read what is written. Notice all these points for yourself.

You should never strain your eyes; that is, everything you read in the schoolroom should be easy to see.

Write a sentence on your slate. Write the same sentence on paper with your pen. The last one is so much easier to read that we know at once that it is the best for the eyes. Ink should always be jet black, even when it is first put on paper. Blackboards and slates should be clean that the writing may show plainly. Dim marks hurt the eyes. The easier it is to see a thing the better it is for the eyesight. This is just as true of books and newspapers as of blackboards and writing paper.

AS THE LIGHT SHOULD FALL

Here is a newspaper. I pick it up from the table and I notice several interesting points about it. Some of the letters are large and some are small; some of the lines are near together and some are far apart; some of them are short and some are long. On the first page of this special paper there are seven columns and most of the letters are no larger than these in this book. On the second page, however, there is but one column. It is a monstrous advertisement with large letters and lines far apart.

I learn from all this that when the letters are small and the lines near together it is best not to have long lines. In fact, the smaller the letters are the shorter the lines ought to be. Notice the length of the lines on this page. How many words do you find in each line?

It is easy to see that if the page you are reading were as wide as a newspaper, if the letters were small, if the lines were packed together closely, and if they stretched across the whole page from one side to the other, it would be hard for the eye to jump back from the end of one line to the beginning of the next. With large letters, therefore, each line may be much longer than when the letters are small.

People who print books usually think of these things. They use white paper and black ink; they do not crowd the lines together; they leave a good margin around the edge of the page; they do everything that will help the eyes and save them from doing hard work when they use books.

If you wish to make a little examination of your own eyes you may use the newspaper again in a different way. Pin it to the side of the room and step as far from it as will let you see the large letters easily. Read with both eyes first. Now read with one eye at a time. While you are using one eye leave the other one wide open, but cover it with something black or with your hand.

If you find that you can read better with one eye than you can with the other, there is some trouble and your

father should take you to a man whose business it is to take care of eyes. He will examine your eyes and tell you what you need.

When you read this page, if you do not see each line and each letter distinctly, or if you have a tired feeling in the eyes, you should tell your father or your teacher.

We call people nearsighted when they have to hold their books very near to the eyes to read; we call them farsighted when they have to hold them too far away. Neither kind of sight is quite right. If you have to hold this book nearer to your eyes than twelve inches or farther off than seventeen inches, you may need glasses. The one who examines your eyes will tell you.

Many children need glasses for a few years only and are able to go without them as they grow older; whereas if they do not have them when they need them, they suffer later. For this reason, if you have any trouble with your eyes, you should have them examined once or twice a year.

QUESTIONS

1. How are houses lighted?

2. Why is it best to have the light fall over the left shoulder on the page?

3. What objection is there to having it in front? behind? on the right?

4. Why should blackboards be opposite the windows and not between them?

5. Give some rules about paper and ink, blackboards and slates.

6. Why should everything be plain and easy to read?

7. Tell what you can about newspapers, long and short lines, large and small letters?

8. When ought the lines to be short? When long?

9. How can you find out whether your eyes see alike?

10. What difference can you mention between nearsighted and farsighted eyes?

CHAPTER XVI

ANIMALS AND ALCOHOL

Sometimes men mix rum and molasses together in a shallow dish and set it where flying insects may see it. These little creatures are so fond of sweet things that they smell the molasses for yards around and hurry from all sides to get it. Possibly they like the rum too, for they seem to enjoy the whole mixture and drink it up eagerly. But imagine what happens afterwards. Before long the insects are intoxicated. Then they lie around so helpless that men catch them without even a net.

Did you ever hear of beautiful drunken butterflies? In South America there is a certain tree from the flowers of which a sweet juice trickles, and hosts of butterflies use this juice for food. Unfortunately, however, while it is still on the tree, it sours and ferments. Now butterflies do not seem to be quite bright enough to know that they take great risks when they use this juice after it is sour. In fact, they are so ignorant that they run their long tongues into the flowers and suck it up as merrily as ever. Then they feel queer, and stagger, and act as some men do on the sidewalks late at night. They cannot fly, they act half-witted, and

when their enemy comes they are helpless and cannot get away.

The enemy is the bird. When he sees these butterflies in this sad plight he is delighted, and picks up one after the other, swallows them joyfully, and looks around for more. If he could talk about it, I suppose he would say that alcohol is one of the best things in the world because it helps him to get a hearty meal every day.

No doubt many a man who sells alcohol thinks so too. But what about the butterflies? And what about the men?

Dr. Hodge was the professor of physiology in Clark University, Worcester, Massachusetts. He was also a student of animals. For this reason, a few years ago, he was asked to find out whether alcohol does human beings any harm in certain directions. He was sure that the quickest and best way to go to work was to press various cats and dogs into this useful service, for he knew, as we do, that things that are unwholesome for animals are usually unwholesome for people, and that food which nourishes animals will generally nourish men too; that is, poison that kills a dog will kill a man, and food that fattens a dog will probably fatten a man.

In this way, then, animals sometimes pass most useful lives. By being rather uncomfortable and not very energetic for a while they have taught careful, scientific men lessons which will end by saving thousands of human

beings from living miserable lives and dying miserable deaths.

In this particular case Dr. Hodge secured the help of several young kittens. He picked out two that were happy and healthy, and tried to make them take milk that

ALCOHOL-DISEASED KITTENS, JUNE 4, 1895; CHARACTERISTIC ATTITUDE

When the photograph was taken, 5 P.M., all the normal kittens were playing actively

had a little alcohol in it. But the kittens would not touch it; they acted as if they would rather starve first.

He therefore opened their mouths very carefully and fed the milk to them, a little at a time. It did not please them, but they swallowed it. Dr. Hodge did this regularly for ten days, and day by day he noticed how it affected the kittens. The result was certainly not favorable, for

although they did not suffer the slightest pain, still they were changed. They stopped playing, did not grow, and did not keep their fur clean and smooth as healthy kittens always do. They did not even care for mice, or feel the slightest interest in any dog. Indeed, they seemed to be dull and indifferent to everything.

All the other kittens acted as usual. They grew bigger every day, played and caught mice, bristled up their tails at any dog that came in sight, purred, and kept their fur in good order.

The picture shows how the alcoholic kittens looked while the others were playing. They did not suffer, but they were dull and half asleep, and had no energy whatever. Finally, however, they were actually ill, and by this time Dr. Hodge concluded that they had taught him at least one great lesson. They had proved that alcohol prevents kittens from growing and robs them of their energy. Accordingly he stopped giving the stuff to them and turned his attention to dogs.

This story is much longer, and I must only begin to tell it to-day.

On Washington's Birthday, February 22, 1895, four puppies were born in two different kennels. Two were brothers and the other two were sisters. They were fine, strong, healthy, young animals, and that was one reason why Dr. Hodge specially needed their help in his important work.

Two of the dogs were a trifle more energetic than the others, and he picked these out for his experiment. He wished to see whether a little alcohol every day would make them at all different from the other dogs who were not to take any.

Each pair of dogs was put into a separate kennel, and each kennel was in a large yard full of sunshine. These

BUM TIPSY NIG TOPSY

Photograph taken November 27, 1895

houses were kept clean and neat, while the dogs had all that the heart of a dog could wish, — plenty of good food, dog biscuit, fresh meat, eggs, and milk, with bones enough besides, so that they could gnaw to their heart's content. Of course they also had fresh drinking water two or three times a day.

The four dogs were treated exactly alike, except in one important respect. Every day Dr. Hodge mixed a little alcohol into the food that went to one of the kennels. The dogs liked their food better without it, but they had good appetites and ate whatever was given them. On the other hand, not a drop of alcohol went to the second kennel. This did not seem to make much difference at first, for all four dogs grew equally fast, and all looked equally strong and healthy.

The dogs had to be named, and Dr. Hodge called one pair Bum and Tipsy, because they took alcohol; the other pair, in the other kennel, he named Nig and Topsy. The first Topsy died soon after the experiment began, and Topsy number two took her place.

The next chapter will tell a little about the history of these dogs. All four were cocker spaniels.

QUESTIONS

1. What happens to certain butterflies in South America?
2. What do the birds do to the butterflies?
3. What was Dr. Hodge asked to find out?
4. Why did he decide to get the help of cats and dogs?
5. What did he give to the kittens with their milk?
6. How did the alcohol affect them?
7. When were the four puppies born?
8. How many puppies were put into each kennel?
9. What were the names of the puppies?
10. What food did they have?
11. Which two dogs received a little alcohol with their food?

CHAPTER XVII

ANIMALS AND ALCOHOL (*continued*)

When the four dogs were two years old an epidemic of dog sickness broke out in Worcester, and it was then that Dr. Hodge hoped to discover whether or not alcohol was doing any special harm to Bum and Tipsy. Indeed it was just at this point that they were able to be especially useful, for when the epidemic of dog sickness appeared they were among the first to take it. More than that, they were so very ill for two weeks that Dr. Hodge says he "hardly expected either of them to live from day to day."

For a week they would not eat anything and he "had to drench them with hot milk and eggs at frequent intervals" to keep them from starving.

Of course, without a moment's hesitation, Dr. Hodge stopped giving them alcohol while they were ill, and at the same time everything in the world was done to make them comfortable and to cure them as speedily as possible.

In spite of every care, however, they did certainly have a hard time. For several days both dogs were blind, and they grew exceedingly thin. Nevertheless they were so

well cared for that little by little they recovered. From that time on, however, Tipsy was blind in one eye.

Dr. Hodge says that both Bum and Tipsy were just as ill as they could possibly be and live. On the other hand, the dogs that took no alcohol hardly seemed to have the disease at all. They did not feel as comfortable

Photograph taken October, 1896

as usual for several days, but they did not lose their appetite, they did not suffer, and they did not grow thin; in fact, they were hardly disturbed enough to be called ill.

Naturally Dr. Hodge decided that dogs that have alcohol in their food get sick more easily, stay sick longer, and suffer more than dogs that do not have it.

This then was the first great lesson which Bum and Tipsy taught the scientists. But this was not enough; there were other lessons to be learned. For this purpose Dr. Hodge now made some delicate little machines and strapped one of them to the collar of each dog. By this machine he could tell from day to day just how much exercise each dog took. He wished to find out which of them did the most running and jumping and playing, because this would show which dogs felt the most vigorous.

Some people think that alcohol makes men spry, but it turned out the other way with the dogs. These machines showed that although Bum and Tipsy had now recovered from their illness, and although they were cheerful and had good appetites, still they were not so active as Nig and Topsy; in fact, the machines proved that they did only about half as much running around as the other two dogs.

Dr. Hodge then made another test in the same direction. While Bum and Tipsy still continued to have a little alcohol in their food every day, he took all four dogs to the gymnasium of Clark University in Worcester and trained them to run after a rubber ball and bring it back to the starting point.

The room was three hundred feet long, and he threw the ball one hundred times for each game of practice. He threw it fast, made the dogs work hard, and kept

careful count, for the sake of finding out which dog brought the ball back oftenest. The result was the same story over again. No matter how hard Bum and Tipsy worked, Nig and Topsy beat them every time, for they brought the ball back twice as often. Yet even though they did not do so much, when the game was over Bum and Tipsy were always more tired than Nig and Topsy. This showed that dogs that take alcohol every day are not so strong as other dogs.

TOPSY
Photograph taken in November, 1895

Through all these days, and in these different experiments, Bum and Tipsy were not suffering in any way. Indeed, they felt quite well and happy; but they made it very plain that when dogs take alcohol regularly they are not so vigorous as dogs that go without it. Compare the second picture with the one at the end of the

TIPSY
Photograph taken in November, 1895

last lesson, and see whether you think Bum and Tipsy look brighter or more dull than when that was taken.

NIG
Photograph taken in November, 1895

While Dr. Hodge was studying this subject he noticed another great difference: Nig and Topsy always behaved like any other well-fed, healthy, jolly creatures. When any stranger spoke to them they were friendly, and wagged their tails cheerfully. When anything happened that they did not understand they were curious about it and bravely went to investigate. When whistles sounded and bells rang furiously they barked furiously too, but they did not act afraid. Just here, then, was the difference. Bum and Tipsy were timid and frightened over everything and over nothing. When strangers came they went off to some corner of their kennel and crouched there. When whistles blew and bells rang they yelped as

BUM
Photograph taken in November, 1895

only frightened dogs can, and sometimes they seemed to be terribly frightened when nothing at all was in sight. Perhaps they were having a sort of dog delirium tremens, but nobody knows about that. All we do know is that Bum and Tipsy always seemed timid and afraid where Nig and Topsy were brave and full of fun.

These separate pictures of Bum and Nig and Tipsy and Topsy show the difference between the dogs very well.

After Bum and Tipsy had been taking alcohol for about three years Dr. Hodge decided to see whether they could recover and be vigorous again like other dogs. He therefore stopped the alcohol. Tipsy died soon afterwards, but Bum lived on. He grew stronger every day until he was almost as strong as Nig, his brother. He played as much and could bring the rubber ball back almost as fast and often. Even yet, however, he was rather timid. He was not taking alcohol now, and everything was being done to increase his health and vigor. Yet during the winter of 1900 a sad thing happened: he began to have trouble with both eyes. They grew worse and worse, and by spring, Bum was totally blind.

Later came another calamity. He had a painful and terrible skin disease, which lasted a long time, and after that he looked like a poor old, blind, feeble dog, but Nig was strong and healthy and happy. He did n't seem old at all, though he was Bum's twin brother.

What difference do you suppose Dr. Hodge discovered in the puppies of the four dogs? During those four years Bum and Tipsy had twenty-three puppy children, but so many of them were deformed, and so many were dead when they were born, that only four lived to grow up. During the same years Nig and Topsy had forty-five puppies. Four of them were deformed a very little, none were dead when they were born, and forty-one lived.

So this is the end of the story of Bum and Tipsy.

Let us cherish their memory, for the lessons they taught may save thousands of human lives.

QUESTIONS

1. What happened when the dogs were two years old?
2. Give the history of Bum and Tipsy while they were ill.
3. What change did Dr. Hodge make in their food?
4. How did the same disease affect Nig and Topsy?
5. What did Dr. Hodge decide about dogs that have alcohol in their food?
6. What did Dr. Hodge do to find out which dogs took the most exercise every day?
7. What gymnasium did the dogs have to practice in?
8. Which dogs were always the most active?
9. Which dogs were bravest when whistles sounded and bells rang?
10. Which dogs were most cordial to strangers?
11. How long did the dogs take alcohol?
12. After Tipsy died what was the history of Bum?
13. How did Nig seem at the same time?

CHAPTER XVIII

THE EAR THAT WE CAN SEE

There are men and women on islands in the Pacific Ocean who look as if they thought their ears were made on purpose to hold flowers or tobacco pipes. They prick a hole through the flesh of the ear, stretch it and pull it, and put one small rolled-up leaf after another into it until the hole is large enough to hold their pipe or their flowers. Sometimes, indeed, it is so large that a man may slip his hand and arm through it to his elbow.

A Stylish Micronesian

These people feel very fine when they look like the man in the picture. He is in the height of fashion, and other people envy him. Women in other countries used to have holes made in

their ears for earrings. But now they fasten the earrings on without any hole whatever.

Look around at the ears in the room where you are and see what each one is like. Just a piece of flesh and gristle with ridges in it, and a hole in the middle, — that is all you will see. It is not always beautiful, but it is useful, and if you did not have any ears on the sides of your head you would look queer enough.

TO CATCH THE WAVES OF SOUND

Yet ears have different shapes. Some are large and some are small; some are long and some are short; some grow close to the head and some stand off like little sails. If you want your ears to be flat against your head, be careful not to sleep with them doubled over; be careful also not to press them out of place either with your bonnet strings or by crowding them down with your cap. For the sake of our friends who have to see us, it is well to do what we can to have bodies that are pleasant to look at.

To tell the truth, a well-shaped ear improves the looks of any one. It also helps to catch sounds from every direction and send them into the hole in the middle of the side of the head. This hole is indeed far more important than the rim itself.

Poke your finger in and see how small it is; cover both ears at once with your hands and notice how little you can hear. If you should stop it up entirely you would hardly hear anything at all, for it is the outside end

THROWING LIGHT ON THE EARDRUM

of the tube that carries sound from the world for us to hear.

It is about one inch long, and the deeper it goes the narrower it gets. Wax and a few hairs do what they can to keep the insects out; yet it is this very wax that troubles us sometimes. The best way to get rid of it is to use a soft, damp cloth over the end of the finger.

Never use anything sharper or harder than that, for the drum itself is at the opposite end of the hole, — the smallest drum and the busiest drum in the world.

The hole is so small and the tube is so narrow that you see no sign of this drum, even if you put your eye close to the opening and look in as far as you can. Doctors know another way, however. First goes in a silver tube; then a reflector, as the picture shows. This sends light to the bottom of the tube and shows the bit of skin that we call the eardrum. It is stretched across the round bottom of the tube and fastened tight on every side.

A man may use the brightest light he can get; he may send it down as far as it will go; yet he will see nothing beyond the eardrum, for it hides everything on the other side. It never opens unless something enters and breaks it, or unless some disease injures it. Thousands of people do not know how easy it is to break the eardrum.

Yesterday I saw a full-grown man put a pointed pencil into his ear and turn it slowly round and round. He acted as if he were giving himself a good scratching. Some day his hand may not be steady, or a neighbor may hit his elbow; the hard point may then break its way through his eardrum and damage it forever.

Strangely enough, boxing the ears may do the same thing. You know how it is when you hit a paper bag full of air: the paper is sure to split from end to end

with a bang. Quite in that way it happens sometimes with an eardrum. An angry man brings his hand down hard on a boy's ear; more air crowds in than the ear can hold, and the drum splits like a paper bag. Shouting in the ear may do it, too; even a kiss on the hole of the ear may break the drum.

Avoid all these things. Think how careful men are to keep dust out of their watches. Remember that ear machinery is more precious than any watch machinery that was ever made, and that dust may damage it through a hole in the eardrum.

QUESTIONS

1. How do some people treat the fleshy part of the ear?
2. What is the outside ear for?
3. Why is the hole important?
4. How long is it?
5. What is the wax for?
6. How should we remove it?
7. Why should we never put anything hard or sharp in the ear?
8. Why is it dangerous to box a boy's ear?
9. What other things should be avoided?
10. If the drum is broken, what happens to the ear machinery?

CHAPTER XIX

THE EAR WE CANNOT SEE

Several years ago a man examined the ears of hundreds of children in Europe and found that about one quarter of them were a little deaf.

These children did not know it themselves; they thought they could hear as well as anybody. The teachers thought so too, only they were quite sure that those special children were the dull ones in the school. No doubt they were rather surprised when the man who examined them found that generally the dull ones were also the deaf ones.

The same man next went to a school in Scotland. There he asked the teachers to pick out seventy bright children and seventy dull children for him to examine. Strange to say, he found about twice as many deaf children among the seventy who were dull as among the seventy who were bright. Naturally enough, with such proof as that, he began to be pretty positive that dullness and deafness often go together.

From there he went to a school in England, where he became even more positive than ever; for here he found that most of the bright children could hear his watch

tick when it was as far from their ears as fifty-one inches, while most of the dull children could not hear it unless it was as near to them as thirty-one inches.

All these experiments showed that when children are a little deaf they seem dull in the schoolroom, and that when they are not deaf they are more apt to seem bright. Nevertheless we know that very often deaf children are not really dull, for doctors have cured them, and after

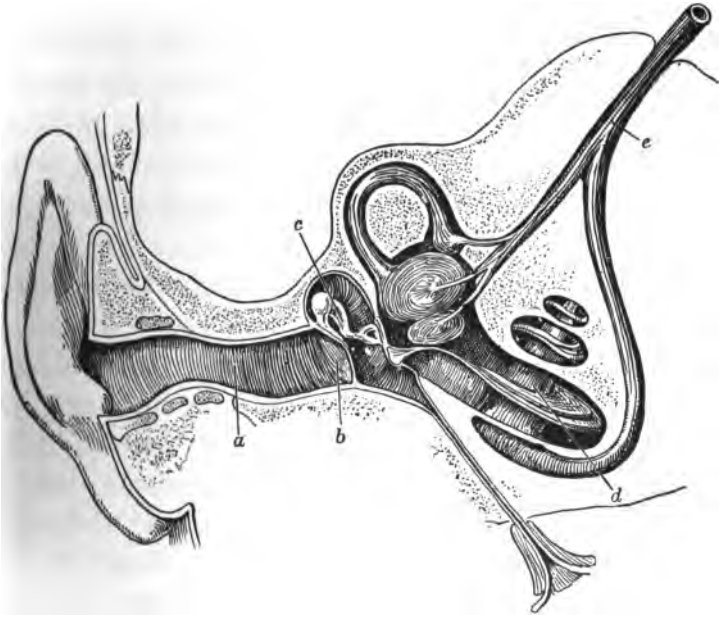
TESTING HIS HEARING

the cure they have been as bright as anybody. Of course the chance is that the better we hear the quicker we shall understand. It is important, therefore, to have good hearing.

If you wish to decide about your own hearing you might try this experiment.

Get several children together; ask some one to hold a watch for you to listen to, and see who can hear it tick the

farthest off. Also test each of your ears separately. Cover one ear while you listen with the other, and decide which hears the better. You may find a difference between them.



A CUT THROUGH THE RIGHT EAR

a, the tube; *b*, the ear drum; *c*, the ear bones; *d*, the snail shell; *e*, the nerve of hearing

If the other children can hear the watch farther away than you can hear it, or if one of your ears hears better than the other, you should tell your father and he should take you to a doctor to be examined. Very likely the doctor will find out what the trouble is and cure you.

The only means we have of knowing anything about the machinery that does all this hearing is what people tell us who have seen what there is on the other side of the eardrum.

First they find three tiny bones that stretch from the underside of the drum to the next part of the hearing machine, which is called the inside ear. Here there are slender tubes full of liquid, within bone channels full of liquid, and a special tube in a bony case that looks like a snail shell.

This inside ear is the most important part of the hearing machine, because the nerves which report the sound to the brain are here. It is so small that you could put it into a box one inch square, but it is more precious than any box of gold, and the bony case that holds it is stronger than any watch case. Every sound that we hear — whether it be a clap of thunder or the whisper of our dearest friend — goes through the eardrum, the tiny bones, the liquid, and the nerves, to the brain; and that is what we call hearing.

Our ears may, however, get out of order. I know a boy who is deaf whenever he catches cold, and with each cold he is a little deafer than he was the time before. The worst of it is that the cold sometimes gives him an abscess in his ear. He had that sort of cold last winter, and I never saw any boy suffer such terrible pain. At last, however, the pain went away and he felt quite well

again; yet he was deaf for weeks afterwards. He could not hear his own watch tick, while any one who talked to him had to shout. I told him he must make up his mind never to take another cold, for at this rate he would be perfectly deaf after a while.

Even people who hear very well do not always hear the same things in the same way. If you should go into the woods when the birds are singing, you would probably hear a great confusion of sounds and songs; perhaps you would not know one song from another; whereas, in the same woods, a man who had trained his hearing for bird songs might say, "I hear the voices of a dozen different birds that I know." And then he would give you their names, — robin, bluebird, flicker, goldfinch, and all the others.

One of the most astonishing things about our hearing is that we can make it careful or careless by the way we use our ears. Listen carefully to a new song or a new piece of music and you will learn it faster. Separate the noises on the city street every day, and you will learn to know each sound by itself. The more carefully we listen, the better we remember; and the better we remember, the more we enjoy what we hear.

Thus one thing helps another: teach yourself to listen to sounds and you will surprise yourself and your friends by the way you remember them.

QUESTIONS

1. What did the man discover about the hearing of children in Europe?
2. Tell about the children in the school in Scotland.
3. What test did he make in the English school?
4. From all these examinations what did he decide?
5. How do we know that a deaf child may not be dull?
6. How may you decide whether you can hear as well as other children?
7. What is the most important hearing-part of the ear?
8. What sometimes makes children deaf?
9. How can we train our hearing?

CHAPTER XX

THE WAY TO TREAT THE FINGER NAILS

There are men in India who make a vow to keep their hands shut tight for ten or even twenty years. Very often they keep the vow, and of course the nails are growing all the time.

At first they grow into the flesh of the palm of the hand; then they go through it. Little by little they crowd between the bones until they make their way through them too and come out on the back of the hand. When that has come to pass, men cannot open their hands even if they wish to; in a strange way they are really nailed shut.

You and I cannot imagine how such a man must suffer, yet people who wear tight shoes may know a little about it. Sometimes such shoes press the nails so hard that they become "ingrowing nails," and these are very painful indeed.

After certain kinds of illness the nails drop off and new ones grow in their place; after other diseases the nail is rough and thick; and always, the older a man is, the more brittle his nails get.

No carpenter, mason, farmer, or writer could do good work if he had a finger nail like a brittle claw on the end

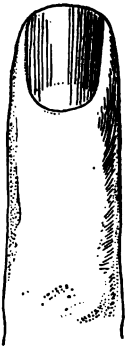
of each finger. This, then, explains certain people in China. They are ashamed to work and they wish their neighbors to know that their hands are as idle as they are fine, so they let one or two finger nails grow very long. These slender claws break so easily that the owner must protect each one with a special covering. The nail protector shown in the picture is three and a half inches long. It is made of silver and is truly beautiful.

AS THE CHINESE PROTECT A FINGER NAIL

Nevertheless, whether we are old or young, whether we work or play, it is we ourselves who decide about our finger nails. We can keep them rough or smooth, straight or crooked, tidy or untidy, just as we choose. Everybody knows this. For this reason, when we see the finger nails of any man, woman, or child, we think we know something about that person.

These two pictures show us two kinds of finger nails. One is oval at the bottom and oval at the top; it shows the pretty white crescent; it is clean and it is trimmed

smooth. From the looks of one such nail we are sure that the rest of the hand is just as clean, and it is easy for us to believe all sorts of pleasant things about the person that owns it.



A FINGER NAIL THAT IS A CREDIT

When finger nails look like the one in the second picture, however, we are quite apt to have opposite thoughts about the owner.

Here the skin grows so high on the nail that the little crescent does not show at all. This makes the whole nail look square and short. See how it is trimmed, — uneven, and short in spots; it also looks as if somebody had taken pains to pack damp dust under the crooked edge. Such a neglected nail!

I think I must tell you that the child who owns that finger was ashamed to have the photograph taken. That is not strange, for when we look at it we are quite sure about the rest of the hand; we are also more than half afraid that the teeth, the body, and the clothes all match it. Finger nails are great telltales.

A FINGER NAIL THAT TELLS TALES

There are two very good reasons why we should take the best possible care of them.

1. For the sake of health.
2. For the sake of beauty.

Many people do not seem to know that, as far as their health goes, it is worse to have dust under the finger nails than to have it on the end of the nose or in the middle of the cheek; for some of the worst microbes may be packed away in the dust under the nails, and such microbes may enter any scratch or cut we have; they may also go into our mouths with the food we touch with our fingers. In fact this is the most important reason for keeping the nails clean, though the second reason is the one that people think most about. They want their fingers to match their clean faces and their clean clothes. They are ashamed not to have one part of the body look as clean as another part. For the sake of beauty, therefore, they keep their nails well cleaned and trimmed. This is a good reason too.

I have heard of children, and grown people too, who trim their nails with their teeth, biting them around the edges. Sometimes the habit becomes so strong that they keep on even when there is no nail to bite. I have a friend who bites until she gives herself pain and the blood comes. Naturally, of course, her finger nails are so short that the flesh rolls over the top of each nail; and the fingers are such queer-looking things that she often doubles them up into her hand to keep them out of sight. She says she cannot stop the biting because she has the habit, and she bites before she has time to think.

There are three reasons why it is a mistake to trim finger nails with the teeth.

1. The pieces we bite off are sharp and hard and bad for the stomach. Yet if they are in our mouths we may swallow them.

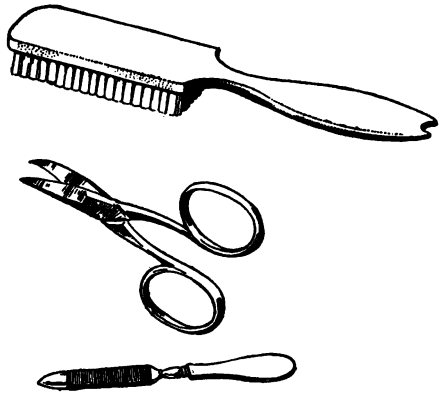
2. No teeth can trim nails as well as a file can do it.

3. If we get the habit of using the teeth, we shall be likely to keep the nails too short. The flesh then rolls over the ends, and instead of having slender, useful, pretty ends to our fingers, we shall have round, blunt finger tips that cannot untie knots or pick up any small thing. We shall be ashamed of our fingers and our friends will be ashamed of us.

There are men and women in every city who spend all their time in taking care of finger nails for other people, but any intelligent person can keep his own nails in good shape with simple things. What we need most is warm water, soap, a nailbrush, a nail file, and a nail cleaner.

You can buy a stiff little brush with a wooden back at any grocery store for three or five cents. It will not be handsome, but the bristles will get under the nails as well as if it had an ivory back. For five or ten cents more you can buy a nail file and cleaner at any hardware shop.

Use the water, the soap, and the brush until your nails really look clean, or until the dust is so soft under them that the nail cleaner will take it out without any trouble. Never clean the nails with a knife or scissors, or any sharp thing that takes out the dust by scraping the nail. You will make it rough, and it will be harder to get the dust out next time. Never scrape the top of the nail either; you will simply make it grow thick and clumsy.



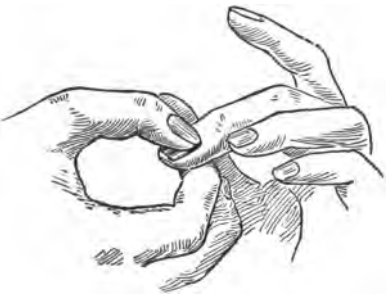
NAIL-CLEANING TOOLS

When the nail is clean, file the edge until it has just the curve you wish. Some people use curved scissors, but a file is best because it leaves the smoothest edge. Pointed nails break so easily that the best style is to make the shape of the finger nails match the oval shape of the end of the finger.

The picture shows how to use the thumb nail of one hand to press back the flesh from each nail of the other hand. Make as much of the crescent show as you can without giving pain to the flesh, and do it when the fingers are damp. If the skin is pressed back little by little every day, the shape of the nails will improve.

When the skin is once in the habit of staying back, and when you once give the nail the right curve, a few minutes each day will keep them in good order.

Very many men and women have to do the sort of work that breaks their finger nails and stains them, yet such people often take better care of their nails than those who never work hard with their hands.



MAKING THE CRESCENT SHOW

Finger nails should be curved at the top, but toe nails should be cut straight across. This keeps the corners from growing into the flesh when the shoe presses the toe. Nobody wants an "ingrowing nail," and we can prevent them if we cut the nails carefully and wear shoes that are not too small.

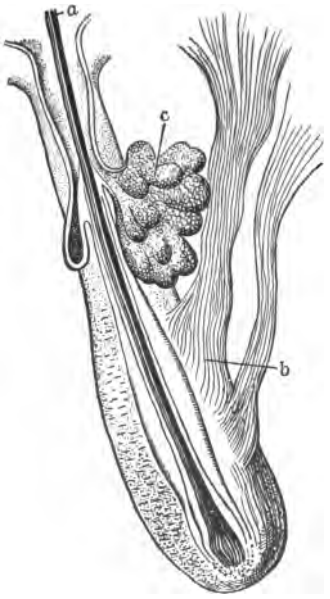
QUESTIONS

1. Describe a well-cared-for finger nail.
2. Give two reasons for taking care of the nails.
3. How may dust under the nails give us disease?
4. Give the reasons why it is unwise to trim the finger nails with the teeth.
5. What do you need to use in nail cleaning?
6. Tell what you would do, step by step, to put your nails in good shape.

CHAPTER XXI

CARING FOR THE HAIR

If you pull out a hair from your head, you will see how long the root is and what it looks like. All you find is a bit of flesh on the end of the hair.



A HAIR IN ITS CELL

a, hair shaft; *b*, muscle; *c*, oil gland

The picture shows what that bit of flesh really is. The pit which the hair stands in is called the hair cell. It is plain, therefore, that when you pulled out the hair, the entire lining of the cell came with it; in other words, you pulled out the whole wonderful cell with everything that was in it. That is what you see on the root of the hair in your hand.

The truth is that each hair stands alone like a small telegraph pole in its own little cell; each is separate from every other one; each has its own muscle, its own oil glands, and you would be able to see them plainly under a microscope.

As a rule, hairs do not stand up perfectly straight. Instead, each slants under the skin as the picture shows, and the way the cell is pointed decides which way the hair shall bend.

When a cat sees a dog and bristles up her tail three times as big as usual, it is because, at the very same instant, each tiny muscle pulls each tiny hair into standing position. When the fright is over, the muscles let go little by little, and those thousands of hairs fall quietly into place again.

HAIR MUSCLES AT WORK

Take the hair that you pulled from your own head and try to stretch it. Look at its size,— so slender, — and see how hard you can pull it before you break it. Its strength will surprise you.

Horsehair ropes are especially strong and useful, but perhaps the most interesting hair rope in the world is in Japan. It was made from the hair of thousands of women who wished to do what they could for a beautiful temple. They gave their long black hair to be used in making a rope to ring the bell with. This rope is long

and strong, and, unless it is burned or destroyed in some such way, it will last for hundreds and hundreds of years, for hair does not decay as bones and flesh do.

In the British Museum in London there is a wig made from human hair. The priest who wore it lived over three thousand years ago, yet the wig does not show its age.

I suppose such things were as useful then as now, and no doubt the same kinds of hair grew on the same kinds of human beings and animals. Human beings wanted theirs for beauty and for use, while animals needed theirs for comfort as well as for use, and both alike needed more hair in cold weather than in warm weather.

Notice how much thicker the cat's fur is in winter than in summer. Though the hair of the human being does not change in thickness from summer to winter, we can ourselves make some difference in the matter. I have heard men say: "I must not have my hair cut to-day, it is too cold;" and no one thinks of having his hair cut when he has a cold already, for he knows it will be a risk. People who explore in cold countries let their beards grow to protect their throats. A football player wears long, thick hair to save his head from the hardest bumps.

It is probably true that women think more of their hair than men do, because it makes more difference with

their looks. Indeed, a woman without hair on her head looks about as queer as a doll without her curly wig, yet there are women who are entirely bald.

I once knew a woman who was so ill that she lost every hair on her head. It came out by the handful, and at the same time her eyelashes and the hairs of her eyebrows dropped out too.

To conceal her loss she covered her head with a wig and painted her eyebrows the color of her false hair. Unfortunately she could do nothing for her eyelashes, so her eyelids had to go like plain, untrimmed curtains.

Every woman of every nation and tribe likes to have a fine head of hair. Even a man seems to like it better when there is hair on the top of his head, and I suppose a baldheaded football player would have a pretty hard time of it. The question for us all, then, is how to get a fine head of hair and how to keep it.

Most important of all is the healthy scalp, and very often its health depends upon how we treat it. We can do two things to help make it vigorous.

1. Keep it clean.
2. Bring fresh blood to it by brushing the hair and by massaging the scalp.

Most heads need washing about twice a month, but heads are like hands in this respect, for the kind of work we do makes a difference in the amount of washing that is needed. A child often needs the wash once a week.

Some people rub a raw egg into the scalp before washing. This does no harm, but an egg on the head is no more important for head washing than an egg on the hands for hand washing. Certain other things are, however, very necessary.

Take a washbowl of warm water and any good soap (I myself like tar soap best), make a good lather, and rub it into your scalp with your fingers or a brush; wash the head and hair thoroughly; then rinse it in a second bowl of warm water. This will take out the soapsuds. Next wash it in cold water quickly to prevent yourself from taking cold afterwards.

Your hair is now clean and sweet. Dry it with towels if you are a boy; if you are a girl the register, the radiator, or the stove will help in winter. Do not go to bed with damp hair. You may catch cold.

Washing is a great help, but exercise of the scalp is quite as important for any head of hair. To get it brush your hair every day until the scalp feels warm but not sore. Five minutes may be long enough. Also, for two or three minutes each day, press the fingers of both hands hard against your head through your hair and move the scalp back and forth on the skull. Do this in one place after another until every part has had its exercise. The special good of all this washing, brushing, and exercise is that it clears away the dandruff, thoroughly cleans the skin, brings the blood to the scalp, and makes the oil

glands active. Washing and exercise are indeed the best hair tonics we can have; many a man has secured a better head of hair by being faithful in their use.

Girls with long, thick hair are sometimes careless about washing their heads; they do not know how much other people are judging them by the looks and the odor of their hair. Washed hair is light and fluffy, sweet and clean, while unwashed hair is solid and heavy, neither sweet nor clean.

The oil glands give hair all the oil it needs. Don't put on any more, for the more oil there is, the more dust it will hold, and tidy men and women do not like to use their heads as a gathering place for all sorts of microbes that are lodged in the dust of the air.

QUESTIONS

1. When you pull out a hair, what comes with it?
2. How many hairs are there in each cell?
3. What other things are in the same cell?
4. What is it that pulls up the hair on a cat's tail?
5. How do we know that hair is durable?
6. What is the objection to cutting hair on a cold day?
7. What two things must be done in order to have a healthy scalp?
8. Describe washing the head.
9. How often should the head be washed?
10. In what ways do washing and brushing help the scalp?
11. What difference is there in the looks of washed and unwashed hair?
12. Why is it better not to put oil on the hair?

CHAPTER XXII

THE HEALTH OF THE SKIN

When a barefoot boy takes a needle and thread and sews stitches in the skin on the bottom of his foot, he does not intend to go deeper than the outside layer, — the epidermis; yet if he pricks himself, he knows at once that he has gone through the epidermis and put his needle into the inside layer, — the dermis.

TESTING THE EPIDERMIS

If no blood comes when a man slices off a bit of skin as he shaves, we know he has cut nothing but epidermis; if blood does flow, however, we know he has cut the dermis too.

The truth is that what we call skin is made up of two layers, — the dermis, that holds nerves, sweat glands, and

blood vessels; and the epidermis, which protects them all and keeps them out of sight. Each layer is as thin as paper.

After you have had a warm bath some day, rub your hand hard over the damp flesh and see how much you can roll up. A good deal of it is dead epidermis, which should be rubbed off. In truth, we shed our epidermis somewhat as a snake sheds his skin; only the snake loses all his skin at once, while we lose ours a little at a time. More than that, his dead skin can do no harm to any one, whereas ours may carry deadly disease. In fact, scarlet fever, smallpox, and measles may go with any piece of epidermis which peels from people who have those diseases. That is why children are kept out of school until they are quite through shedding the skin they had while they were sick. They must not share their epidermis and their disease with other children.

SWEAT GLAND

So far as the skin is concerned the sweat glands play an important part. Each separate one of them is a tiny twisted tube under the dermis. It runs up in a crooked fashion through both layers of the skin and gives an extra twist or two just before it comes to an end on the surface of the epidermis. Each pore of the skin that you see is the mouth of a separate sweat gland. These glands

are crowded close together over the whole body; they work fastest when we are warm, and the perspiration that they pour on the skin needs to be washed off regularly.

Now notice several facts about this perspiration.

1. It is a mixture of water and waste matter from the body.

2. The water evaporates soon.

3. While it is evaporating, it cools the skin.

4. After it has evaporated, the waste matter that was in it stays on the skin.

5. This waste mixes with oil from the oil glands, bits of epidermis, dust from our clothes and from the air, and stays like a snug, thin coat on the outside of our body from head to heel.

6. Unless it is washed off or rubbed off, this coat grows thicker every day.

7. The thicker it is, the less perspiration will get through it to cool the skin and to regulate the temperature of the body.

8. When the temperature of the body cannot be regulated by the sweat glands, health itself is apt to suffer.

9. When perspiration is checked, some other part of the body must dispose of what should have gone off through the sweat glands.

This list of facts shows that unless the skin is well cared for it gets into a bad state; yet we do not see the thin, outside covering of waste matter, oil, and epidermis until there is dust enough in it to give a brown color to the skin. Then of course we are shocked or distressed. We promptly say, "That child needs a bath," or "That boy looks as if he had n't bathed for a month."

At that time the body or the clothes are apt to give another sure sign that they need cleaning. That sign is an odor, and it tells the story as plainly as if it screamed aloud.

I have a ten-year-old niece in the fourth grade of a grammar school, and she calls one of the boys in her class "that smelly boy." Yesterday she said: "I hate to stand near that smelly boy at the blackboard." What she said simply shows the difference there is in children as well as in grown people. Some are clean and some are unclean; some are washed all over, and some are washed in spots; some look as if they had used wash cloth and towel so vigorously that every pore of the skin is clean; others are so dingy round the neck and ears that it seems as if they hardly know what soap and water will do.

Indeed, some people give the impression of being clean, while from other people, in spite of fine clothes, there may be an odor which will betray them.

Is it strange then that washed people do not like to have unwashed people around? The fact is they so

thoroughly dislike having them near that they can't help showing their objection sometimes. Of course this hurts the feelings of the unwashed; still, if they are bright enough, they will see what the matter is, adopt the habit of bathing regularly, and join the army of the clean.

For the sake of cleanliness we should change our underclothing in the morning and at night, and shake it to get rid of bits of epidermis and waste matter from the sweat glands which cling to it. A hard dry rub with a coarse towel is helpful.

By adding to this a warm bath once a week any one can keep the skin in good condition. A quick, cold bath every morning before breakfast is good for most healthy people. It does as much as anything else to keep one healthy. Some use a bath tub, others use a washbowl; either is suitable. Here are a few rules.

1. Take your cold bath in a warm room.
2. Wet the skin quickly.
3. Wipe hard and dry with a rough towel until the skin is pink.
4. If you use a washbowl, wash and wipe part of the body at a time. This will keep you from taking cold.
5. You should feel warm after your bath; if you feel cold instead, you are not vigorous enough to take daily cold baths.

My niece who does not like the "smelly boy" takes her cold bath every morning in five minutes. This sort of quick bathing helps the body resist disease; it gives the nerves of the small blood vessels such vigorous, healthy gymnastic exercise that they get into good habits of controlling the flow of the blood back and forth, and the better they do this the less likely we are to take cold. If possible, before taking the cold bath, spend five minutes in giving vigorous exercise to arms, legs, and body. This will help immensely in making the quick, cold bath useful to you.

For warm bathing, remember two points:

1. If you take the bath in the daytime, always dash the body with cold water afterwards. This will keep you from taking cold.

2. If you bathe in warm water just before getting into bed, you do not need the cold dash, for the bedclothes will keep you from taking cold.

Give yourself a clean, healthy, vigorous skin, and you will grow faster, be in better health, and be less likely to take cold.

QUESTIONS

1. How many layers are there to the skin?
2. Give the names of the skin layers.
3. What is the use of the epidermis?

4. What diseases may go with bits of epidermis?
5. What important things are in the dermis?
6. What does the sweat gland do?
7. Why do we need to bathe?
8. What should we do to escape taking cold after a warm bath?
9. What are the important things to think about when we take the quick cold bath?
10. What is the use of the cold bath every morning?

CHAPTER XXIII

ALCOHOL AND COLD WEATHER

If doctors only knew of some safe drink that would make people comfortable no matter what the weather might be, everybody would keep a bottle of it in the house.

There are those who seem to think that almost any kind of wine, whisky, or beer will do this; many people are quite sure that when the weather is biting cold they really need some one of these alcoholic drinks to keep them warm.

A company of strong men thought so when they were traveling across the western plains several years ago. There were twenty-six of these men; it was winter and they had to spend a terribly cold night in their camp without any fire. They had food enough and plenty of whisky; but one of the men knew more than the others, and while they were talking about what they should do to keep warm, he said that for one thing it was not safe for any of them to drink whisky that night. He even went so far as to say that they were far more likely to freeze if they drank it.

Two of his friends believed him and the three took no whisky before going to sleep; they were cold in the night

but they were not very uncomfortable. Three of the other men drank a little; they were much colder than the first men but they did not freeze. Seven men drank more and their fingers and toes were frostbitten by morning. Six drank a good deal and they were so badly frozen that they never really got well again. Four drank until they were foolish and one after the other they all died three or four weeks afterwards. The last three men were drunk when they went to bed and by morning they were frozen to death.

Each one of these men was strong the day before, and each had the same number of blankets that night. It seemed to be just the whisky and nothing else that made the difference.

One of the men in the party wrote to a medical paper in Cincinnati, Ohio, about it, and the point he made was that the more the men drank the more they suffered from the cold.

A great many people believe as these men believed. They say, "When I am cold and take whisky, I know it is good for me because it makes me feel warm." Perhaps such people will understand what the matter is if we explain just what happens when a man drinks alcohol.

One of the first things alcohol does — if a man takes enough of it — is to enlarge the small tubes that carry the blood to the skin all over the body. Now if these blood vessels are enlarged, more blood passes through

them, and the skin feels warm and comfortable for a little while. Unfortunately, however, the warmer the skin is the more it takes from the real heat of the inside of the body. The outside feels warmer after a man drinks alcohol, because the blood is there, but the inside is just so much the colder to make up for it.

For our best health it is most important that the temperature of the inside of the body should remain the same day and night, winter and summer. Anything, therefore, that reduces the inside heat too much is bad for us. Now the reason a man does not notice the change when the inside of his body is growing colder is that alcohol is also doing another thing. It is making the nerves less sensitive. This is most serious, for our nerves are as important to our body as an engineer is to his train. If the engineer of a train is stupid, or if he is asleep, the train is not safe. No passenger cares to travel for a moment on a train with a sleepy engineer. So it is with the body: dreadful things may happen to it if the nerves are too dull to tell us when we are in danger.

That is what happened to those men in their camp. No doubt those who took so much whisky felt a good deal warmer when they went to bed than those who did not take any. They felt so warm that they could not imagine they had disturbed the heat regulation of their bodies; they did not know they were in danger. Perhaps they dreamed they were warm and comfortable even

while they were freezing to death. They did not know that they had taken something that would put the heat machinery out of order. They wanted to do all they could to keep warm and safe, but they were ignorant and it turned out that they did just the wrong thing.

I suppose that hundreds of people make the same mistake every winter. It is hard for them to believe that their feelings deceive them. But people who travel in the coldest countries learn the lesson after a while.

In a book by the great physician, Dr. Carpenter, I read that there was a crew of sixty-six men from Denmark who tried to stay in Hudson Bay all winter. Now the place is so far north and so cold that the men wished to do everything to keep warm; they therefore took a load of alcoholic drink with them to help as much as possible. No doubt they thought that the colder it was the more they ought to drink, for that is just the mistake a great many people make.

Nevertheless, in spite of everything, these men died one after another, and by the end of winter only two were alive. At another time a crew of Englishmen went to the same place, and they were just as anxious as the others to keep warm and to keep alive, but they tried the opposite plan about alcoholic drinks: they decided not to take any with them. There were only twenty-two men in this crew. They took no alcoholic drinks, and when winter was over they sent the joyful news to their

friends that twenty of them were alive and well. Only two had died.

Nowadays people who explore the coldest countries are very careful about what they drink there and just when they drink it. They are sure that it is not best to drink anything that has alcohol in it while they are well and working hard. When a man is ill the doctor should decide what is to be done.

If Dr. Hodge could have taken Bum and Tipsy and Nig and Topsy on a sledding trip to Greenland, and if he could have hitched Nig and Topsy to one sled and Bum and Tipsy to the other, he would have found that Nig and Topsy traveled faster than Bum and Tipsy every day, went farther, and carried the heavier load.

In such matters as this it is about the same with men as with dogs.

Dr. Hayes was a surgeon who went with Dr. Kane to explore in the Arctic regions. Afterwards he said that he would never again take any alcoholic drink with him on such a trip, and that he would not let anybody go with him who had ever used such drinks. He said he knew from experience that those who use alcohol cannot endure the cold so well as other people.

All these facts show that the man who wants to do the thing that is safest for his health and the man who wants to do the best work he can in cold weather need to go without drinking.

QUESTIONS

1. Tell what happened to the party of men crossing the western prairie.

2. Which men suffered the least? Which suffered the most?

3. Why do people think whisky warms them?

4. When alcohol enlarges the blood vessels of the skin, what happens to the inside temperature of the body?

5. Tell about the crew of sixty-six men who went to Hudson Bay.

6. What did they drink and what became of them?

7. What was the story of the crew of Englishmen?

8. If Nig and Topsy and Bum and Tipsy had gone to Greenland, which two of the dogs would have done the most work?

CHAPTER XXIV

ALCOHOL AND WARM WEATHER

Probably somebody will say, "Well, then, if alcohol does n't keep people warm in cold countries, it must be just what they need when they are too hot and want to cool off in warm countries."

But it seems that alcohol puts the heat machinery out of order even faster in India and Africa, where it is warm, than it does in Greenland, where it is cold.

Dr. Parkes was a famous English doctor. He was also a teacher in an army medical school, and he wanted the soldiers to be so healthy and so vigorous that they would always win in whatever battle they were fighting. He knew that so far as the health is concerned, it makes just as much difference what a soldier eats and what he drinks as what anybody else eats and drinks; and he knew that when soldiers are marching in terrible heat, and when the days are so warm that brave men lose their courage and their strength, they ought to have anything in the world that will help them. He therefore tried to find out what things did the soldiers most harm, and what things helped them the most. He studied the English soldiers in India, and he saw that many of them took alcoholic drinks.

Then he took pains to notice which soldiers were the healthier, and which made the better fighters, — those who drank or those who did not drink.

He heard that in a certain regiment there were four hundred men who did not take alcohol, and at once he began to keep a record of those men and of the other men in the same regiment. He discovered that the men who did not drink could march farther without getting tired, fight harder without running away, and live longer without getting ill. After that he always said that warm countries "are precisely the climates where alcohol is most harmful." Since then many other men all over the world have said the same thing.

Sir Charles Napier gave an address to a company of soldiers in India, and he said: "Let me give you a bit of advice. Don't drink. You are come to a country where, if you drink, you are dead men. If you be sober and steady, you 'll get on well; but if you drink you 're done for. I knew two regiments in this country: one drank, the other did n't drink. The one that did n't drink is one of the finest regiments and has got on as well as any regiment in existence. The one that did drink has been all but destroyed."

When soldiers are ill in India they have to go to the soldiers' hospital, and it is easy to find out there which kind of men get sick the more easily, — those who drink or those who do not drink.

By studying the figures, Dr. Carpenter learned that if a man drinks he is three times more likely to get ill and have to go to the hospital than if he does not drink, and that after he is in the hospital the man who drinks is far more likely to die than the man who never drinks.

Every year the officers of the armies in different countries of the world are finding out that the longer their soldiers go without alcoholic drinks the better they can march and fight.

In 1898 Lord Kitchener took his soldiers on the longest march that anybody has ever written about. They were in Sudan, Africa, and they marched across the desert sand where the sun is blazing hot. More than that, when they reached the end of the march they fought a terrible battle — and they conquered. This was what people call a total-abstinence army, which means that none of the soldiers took any alcoholic drinks whatever.

Mr. Stanley was a great traveler in Africa, and he says that in such warm countries no one should dare to touch a drop of alcohol in the daytime. Most people who go off hunting in Africa and India believe the same thing. They say that if a man is in the habit of drinking he is not so strong for the hunting trip and not so likely to hit the lions and the tigers when he sees them.

Thus we learn that alcohol is a man's enemy in cold countries and in hot countries, in winter and in summer, when he is well and when he is ill.

QUESTIONS

1. How much more useful is alcohol in warm countries than in cold countries?
2. In what country did Dr. Parkes study about soldiers and alcohol?
3. What did he learn about those four hundred men?
4. What did he say about warm countries and alcohol?
5. What did Dr. Carpenter find out about soldiers in the hospital in India?
6. What did Sir Charles Napier think about alcohol for soldiers?
7. What did Lord Kitchener's total-abstinence army do?

CHAPTER XXV

SOME FACTS ABOUT THE NOSE

When a dog wants to find his master, his nose is often quite as useful as his legs. He puts it near the ground and smells his master's footsteps as fast as he can run.

Bloodhounds can find a burglar in the same way, while wild deer can smell their enemy a long way off if the wind is blowing from that direction. If the hunter himself had as keen a nose as that, I suppose it would help him in his hunting, but it would make it that much harder for the deer to save his life.

In any case our nose is as useful as we need. It tells us even in the dark or when our eyes are shut which flower is a rose and which is a lily; it warns us when the gas is escaping and we know by it when the room is too close, when there is tobacco smoke in it, and when the air is impure from sewers or garbage cans or soiled things.

Though the nose is so useful, it is not always beautiful. It may be long and thin like a knife blade, or it may be short and thick like a small club; it may curve up like a queer little handle, or it may bend down like a broken-backed man; but the shape does not change

its usefulness: a healthy nose is a busy part of the breathing machine, and it is well made.

Feel the bone that is between your eyes: it is hard and firm; you cannot move it. Now take hold of the end of your nose: see how you can bend it from side to side like a piece of India rubber. If the whole nose were solid bone from root to tip there might be broken noses at every recess; but the part that is hit most often can only be hurt; it cannot break because it is made of something tough and limber called cartilage.

The nostrils are openings of tubes that admit air to the lungs. Feel the thin partition between them; a few hairs are inside of each nostril to help keep the dust out.

The tear tube is there too. It runs from the pink corner of the eye down into the upper part of the nose, where the tears go. It is most busy and most useful when you cry. Indeed, the reason that you need to blow your nose very often just then is that a tiny stream of salt water is running through the tear tube into the nose and you must get rid of it.

Without any doubt the lining of the nostril is as interesting as any part of the nose. It is like a thin, delicate lace work of small blood vessels, and it is called the mucous membrane. This is where the mucous glands are, and they send out a thick fluid that keeps the lining damp. When you have a cold in the head it is these glands that do the extra work of mucus making. Then

you say, "My nose is running," and you have to use your handkerchief every few minutes.

In the case of such a cold as that you can neither smell nor breathe easily. In fact, you really have to use your mouth for breathing, instead of your nose, which is a great misfortune. It is bad for your health and bad for your looks. I have seen children sit, and stand, and walk, and play with their lower jaw hanging down a little. Probably they had no idea how dull and foolish it made them look, and certainly they did not know that they might injure their lungs by breathing in that way.

WHERE AIR IS WARMED AND CLEANED FOR THE LUNGS

Even without any cold the mucus keeps the nose so damp that the air itself grows warm and damp on its way to the lungs. This is precisely what the lungs need. Then, too, between the damp skin and the hairs of the nose the dust and the microbes are almost sure to be caught and stopped from going any farther.

From all this it is very plain that we must do everything we can to keep from catching cold, because we cannot afford to have our nose stopped up for even

one day. If you have no cold in your head, yet cannot breathe when your mouth is shut, something is the matter, and your father should take you to see the doctor.

There are three reasons why we should breathe through the nose and not through the mouth.

1. The nose warms the air for the lungs.
2. The nose helps the air to be damp before it gets to the lungs.
3. The nose cleans the air for the lungs.

It is easy to see that a bad cold in the head stops all the work of the nose. When the air comes through the mouth to the lungs it is not so clean from dust and microbes as it ought to be, it is not damp enough, and it is not so warm as when it goes through the nose. The sensible thing, then, for any person to do is to keep from catching cold, to shut his mouth, and to breathe through his nose.

Still there is another extreme: when we try not to catch cold we may actually get the nose too dry. That is apt to happen in winter when people live in houses that are heated by stoves, furnaces, or steam pipes. Often in such places the air is so dry that the nose cannot help getting dry too. You know how it is with wet towels over a register or near a radiator: the hot air takes all the water out of them, and they are dry in no time. Hot air does the same thing to any damp nose that

happens to be in the same room. The objection to this is that when the lining of the nose is very dry it cannot catch the dust and microbes in the air and keep them from the lungs; neither can it keep the air that is to pass into the lungs damp enough; in fact, it is about as well to breathe through the mouth as through such a dry nose.

But what shall we do about all this? We must remember that the more water the air takes from other things the less it will take from us. For this reason some people put open dishes of water in their rooms, or plants that grow in water, or wet fern balls. Anything is useful that gives water to the air.

In my own home water is heated near the furnace in the basement. Damp air from it then mixes with the pure air from out of doors after the latter has become warm, and they rise together to the different rooms of the house.

If you have a healthy, useful nose, try to keep it so. Some of the rules for the health of the nose are the same as those for the health of the skin.

1. Take a quick cold bath every morning.
2. Change your clothes, your shoes, and your stockings when they are damp.
3. Do not sit in a draft.
4. Breathe pure air by day and by night.

Sometimes a nose is not useful because bunches of tissue grow in it and close up the tubes. These growths are called adenoids. A child with adenoids has to breathe through his mouth. Often his health suffers from this. Often also he becomes deaf. Very often he is so dull in his classes that he cannot learn his lessons. The one thing to do with adenoids is to have them taken out. A doctor can do this quickly and easily. After they are out the child generally becomes healthy and bright and quick-witted again. Thousands of children have been helped in this way. If you cannot breathe easily with your mouth shut, have a doctor examine you for adenoids. If they are there, be sure to have them cut out. A person with adenoids often shows it by the shape of his jaws. They have a queer shape because, while they were growing, their owner breathed through his mouth and not through his nose.

QUESTIONS

1. In what way is the nose specially useful to dogs?
2. What warning do we get from the nose?
3. Describe the tear tube.
4. Describe the lining of the nose.
5. What do the mucous glands do?
6. In what way does the damp mucus of the nose help the lungs?
7. Give three reasons for breathing through the nose.
8. Why is it better to have damp air in a room?
9. How can we keep the air in a room damp in winter?
10. Give rules for the health of the nose. Describe adenoids.

CHAPTER XXVI

OUR LUNGS

If your clothes are very loose around the waist, take a long, deep breath and see what happens.

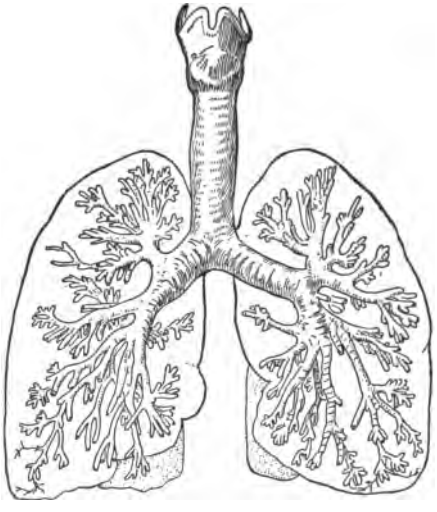
Your ribs rise higher and higher; you get larger around the chest; your waist is bigger. While you are doing this you really feel as if you were working with your body. And so you are: your muscles are pulling up the ribs and you are stretching out the lungs with the air you put into them. In fact, our lungs are like a pair of useful bellows: we pull up the ribs and the air rushes in; we drop them down and the air streams out of the nose and mouth.

These wonderful bellows work day and night, when we are asleep and when we are awake, from the time we are born until we die; but how little we think about them! how little we do to take care of them!

Fortunately they are in a strong cage with bones on every side. The backbone is behind, the ribs are on the sides, and the breastbone is in front.

Some day when your father does not know about it watch to see how many times he draws his breath every minute. Some men breathe fifteen times a minute; an

elephant breathes only eight times, and I have heard that a mouse breathes a hundred and twenty times each minute. This breathing is so important that we should die in a few minutes if the air could not get into our lungs. Then, too, the more air they hold the better it is for us.



THE AIR TUBES OF THE LUNGS

Each lung is somewhat like a big sponge. If you could take a piece of one of them in your hand and squeeze it hard, you would make a large slice look very small. The reason is plain. The main part of each lung is a bunch of branching tubes. It looks like a tree hanging downwards; only in the tree of the lungs every twig and branch is hollow, and you know a bunch of hollow tubes can be squeezed up small.

Look at the picture carefully and you will see that the largest tube is at the top. This is the windpipe. Now press your finger up and down in front of your neck and you will find several ridges. They are rings of cartilage which hold the windpipe out round and

firm. All the air you breathe goes from your nose or mouth down to the lungs by this road; but when a bit of food or water tries to make the same journey, we cough and almost strangle in trying to get it out. At the same time we know that the trouble is with the little swinging door of cartilage between the windpipe and the food pipe. It did not shut down soon enough and the food went the wrong way.

You can see that the windpipe has two branches: one goes to one lung and one to the other. After that, each of these branches divides and keeps on subdividing into smaller and smaller branches and twigs, until the real skeleton of the lung is a beautiful tree like the one in the picture.

The air sacs are too small to show in the picture, but there is one of them on the end of each twig. They are so tiny that nobody sees them without a microscope, and there are so many of them that all the blood of the body comes to them and goes away again. It brings carbon dioxide gas when it comes, and it takes oxygen when it goes away.

That is why the lungs are so important: the blood must have oxygen for the body to use. The reason for breathing is now plainer than ever: whenever we take a good breath of fresh air we send a quantity of this oxygen into our lungs; and of course, the more we draw in the deeper down it goes and the more the blood gets.

Any man, woman, or child can see that every tube of the lungs ought to be kept open so that the air may go in and out easily and give the blood a chance to get all the oxygen it needs; yet I have seen girls who looked as if they had never read a book on hygiene in their lives, for they dressed as if they did not know they had any lungs. You can tell such a girl at a glance. As a rule her waist is very small.

Some people used to think that a small waist made a woman look delicate and beautiful, but in these days we are sure that it makes her look ignorant and out of shape. We think so because we know what she has done to the inside of her body. She has squeezed up hundreds and thousands of air tubes and air sacs until they are like a useless sponge. When that happens, neither the lungs nor the blood can possibly get as much air as they need.

The worst of it is that the less air our lungs get the easier it is for them to become diseased. When every air sac is full of air, the blood takes the oxygen out of it as fast as possible; it also leaves its load of carbon dioxide there in place of the oxygen.

There are, then, two things that the lungs do for us all the time: they take oxygen into the body with the air for the blood to use, and they send carbon dioxide out of the body because the blood is through with it.

QUESTIONS

1. What happens to ribs and chest when you take a long breath?
2. When do the lungs work?
3. What do lungs look like?
4. What is the name of the largest tube?
5. What is it for?
6. What is at the end of each one of the smaller tubes?
7. What gas does the blood bring to these cells? What gas does it take away?
8. What does lacing do to the lungs?
9. What harm is it if the lungs do not get air enough?
10. What two things do the lungs do for us?

CHAPTER XXVII

LUNGS, DUST, AND TOBACCO SMOKE

The next time you play tag or any other exciting game that makes you run, notice your breathing.

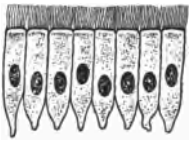
You will see that the harder you jump or run the harder your lungs will have to work. You will have to breathe fast; you will fill your lungs with air over and over again; and even then perhaps you will say, "Oh, I 'm all out of breath!" But that sort of exercise is the very best thing for your lungs. It makes them grow.

The next best thing is to stand out of doors every morning and take ten deep breaths of fresh air, and every night before going to bed do the same thing. While you are doing this there are several things to think about. In the first place stand straight like a soldier, holding your chest forward. A sponge that is crowded tight will not hold much water, and air cells that are doubled together will not hold much air. The first duty then is to hold the body in such a way that every air cell will be open and free.

Now breathe slowly until the lungs are really full, but do not strain them; then breathe the air out as slowly as you breathed it in.

Do this faithfully every morning, and do it whenever you think about it during the day. The breastbone is not hard when you are young, and if you are careful to hold the chest up and breathe as you should the bones will have a fine curved shape, and in the end you will have a big, healthy, splendid chest and lungs.

You know what sort of air you ought to breathe, and you know about oxygen and carbon dioxide. There is also dust in the air, which is very injurious to the lungs. They cannot always save themselves from this, though they do a good deal at it by a wonderful arrangement which they have.



CILIA READY FOR WORK

On the inside of the largest tubes of the lungs and inside the nose there are thousands and thousands of little threads called cilia. These cilia are like the tip ends of the very finest cobweb silk, and they are moving all the time like tiny paddles. They are busy day and night, through winter and through summer, for their duty is to keep dust and microbes from getting into the lungs.

They are the air cleaners of the tubes, just as certain men are the street cleaners of the city. When there is dust in the air they paddle hard in such a way as to drive it out of the lung tubes and out of the nose. They manage very well most of the time; still, when the lungs belong to a man who not only lives in the dust all day

but also breathes with his mouth open all night, the cilia have far too much to do: more dust gets in than they can drive out, and it rushes past them, goes into the most delicate tubes and air cells, stays there, and does mischief. This explains black lungs.

The other day a doctor told me that he had just examined the lungs of a man who had died in Chicago. He said that the man had always lived in the dustiest part of the city, and that after he died, when the doctors cut his lungs open, they noticed how dark they were. Besides that, certain spots were as black as ink.

No doubt the cilia had worked as hard as they could, but the man had probably breathed in more dust than they could drive out, and it may be he had breathed with his mouth open.

Though dust is bad enough, microbes in the lungs are even worse. Yet how hard it is to keep microbes out of the dust! We learned that in the ninth chapter. We also learned that microbes of consumption may give the disease to healthy people and that we must do all we can not to breathe them.

In dusty streets and smoky places it is especially important to breathe through the nose, because the nose cilia will help the lung cilia; but in the very dustiest places of all we should use a veil or a respirator to sift out as much dust as possible. We should also avoid talking in such places.

Our lungs are not only like the branches of a tree but they are like two big bottles with one small mouth. When the cork is in a bottle the water cannot evaporate fast. It is so with the lungs: when the mouth is shut the tubes do not dry very quickly,—and for the sake of the cilia they need to be damp.

That is one of the good reasons for not smoking tobacco. When a man sends warm, dry tobacco smoke into his lungs, as some people do, he does three harmful things to his breathing machine.

1. He keeps the cilia too dry.
2. He sends such a cloud of smoke against the cilia that a great deal of it manages to get into the lungs.
3. There is a poison in the tobacco that a man smokes, and when the smoke gets into the lungs, of course the poison gets there too. The cilia cannot send it out.

The lungs are so important and so delicate, and the cilia are such good friends of ours, that we should help them in every way.

QUESTIONS

1. What does exercise do to breathing?
2. What good does deep breathing do to the lungs?
3. What kind of air should be used?
4. What are cilia like?

5. What do they try to do?
6. What happens when the cilia have too much to do?
7. What is worse for the lungs than mere dust?
8. How shall we protect our lungs in dusty places?
9. Why should we keep from talking on a dusty street?
10. What harm does tobacco smoke do to cilia?
11. Mention three ways in which warm, dry tobacco smoke may injure a man's lungs.

CHAPTER XXVIII

TEETH

Once every week I meet three pretty girls and two big boys who belong to the same family. They have soft brown hair, merry eyes, and they dress well, but, whenever they smile they show such yellow teeth that I feel like saying, "Children, children, why don't you wash your teeth?"

Whenever one of the girls gets a new hat, or one of the boys buys a suit of clothes, my first thought is, "You poor child! you wish to look fine, and you think you look quite fine already, but a toothbrush would help you more than anything else in the world." The trouble with their teeth is that they never wash them.

I have a young lady friend with a funny little pointed mouth. Her teeth are clean, to be sure, but the upper front ones reach over the lower ones so that they never help each other when she chews. When this young woman was a little girl she sucked her thumb every night when she went to bed. She even sucked it by daylight too, sometimes, so that little by little she changed the shape of her upper jaw, and now if you should see her you would think that she had done all she could to make herself look like a squirrel.

I know of a boy with a mouth full of good-looking teeth. The second picture shows how straight and even they are now; but when he was eight years old some of his teeth were as crooked as the cobblestones on an old down-town city street. The first picture shows how they looked at that time.

This troubled his father so much that he took him to a dentist who was a clever man, and he managed to make them grow in the right way. The boy can now chew his food better than he did before, because the upper teeth and the lower teeth are opposite each other and work together.

THE WAY THE TEETH GREW

Go to the mirror. Look at your own teeth and answer these three questions about them. Are they clean? Are they crooked? Do they look as if you had ever sucked your thumb or your fingers?

If they are crooked the dentist can help you, and you ought to go to him before the jawbone gets harder. It is easier and quicker work to straighten young teeth than old teeth.

If your teeth are not clean, you must wash them; and if you know of any child that sucks his thumb, you must help him to stop it.

Now count your teeth, and ask your father to let you count his teeth too. He ought to have thirty-two altogether. Probably some of your baby teeth have fallen out, but when you were six years old you had ten teeth above and ten below. Just now you are getting your new teeth, and they must last the rest of your life, for when the second teeth are gone, no others will come to take their place, and false teeth are a nuisance.

AFTER THE TEETH WERE STRAIGHTENED

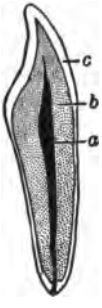
Look carefully and you will see that each tooth has one just like it on the opposite side of the same jaw.

The shapes of your front teeth and your back teeth are different, as they have different kinds of work to do, but every tooth in the world is made in the same way. The soft part is in the center, and that is where the nerves are also. It is called the "pulp." Hard bone is around it, while outside of all comes the enamel. This is the hardest thing in the body, yet it is the only part of the tooth we have to be careful about. We must do two things to preserve it.

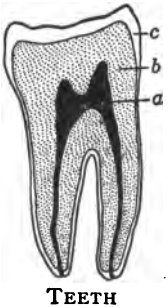
1. Keep it clean.
2. Keep it from getting cracked or broken.

The reason for both these directions is the same: we must save our teeth from the microbes.

I have a queer-looking string of teeth in my attic. Once these teeth were growing in the mouth of a heathen man in Micronesia, but his enemy caught him and killed him, pulled out every one of his teeth, and threaded them on a string. I suppose this enemy knew that when teeth are not in the mouth they will last for ages and ages, and probably he wanted his children and grandchildren to believe that once upon a time he had been strong enough to kill his foe.



If the man had lived until now, his teeth would have been ruined long ago, and it would have been the microbes that did it, for they can destroy the teeth in any man's mouth; but when teeth are clean and dry, threaded on a string, and packed away in the attic, no microbe touches them.



TEETH

a, nerve; *b*, bone; *c*, enamel

This teaches us a great lesson: the cleaner we keep our teeth the longer they will last. Microbes go wherever there is any food and moisture, and the longer the food stays in one spot the more the microbes will gather just there. They will enter any crack and work their way deeper and deeper toward the nerves in the pulp. When they reach far enough we suffer and have to go to the dentist.

No crack is too small for microbes to find and enter. If you cut your finger the flesh will mend itself, but the enamel of the tooth can never grow together again after we have cracked it. That is why we should not crush nuts or any other hard thing with our teeth; we cannot afford to crack the enamel that protects them and saves them from microbes.

Even when there are no cracks, if bits of food stay in one spot long enough the microbes will not only make a hole for themselves just there, but after that hole is once made, they will go in without asking your permission and do the greatest mischief.

We can save ourselves from these teeth microbes in only one way, and that is by keeping the teeth as clean as possible. Of course we cannot thread them on a string and put them in the attic to keep dry, but we can do several other things that are more sensible.

1. Get a toothbrush that is just stiff enough not to hurt your gums. The bristles should not be too near together, because you want them to go between your teeth.

2. Have some tooth powder.

3. Use toothbrush, powder, and water every morning; scrub every part of your teeth thoroughly; you will have to screw your brush around pretty well to do it, yet only in this way will you dislodge the microbe.

4. Every night before you go to bed take a piece of soft silk thread and draw it between as many teeth as you can. This is better than a toothpick. You will get a speck of food almost every time you pull the thread through.

If you can wash your teeth after each meal, that will be better yet; but use the powder only once a day.

If you have poor teeth, go to the dentist twice a year. This will save you from pain and will make your teeth last much longer.

QUESTIONS

1. What sort of people sometimes have unwashed teeth?
2. What does sucking the thumb and fingers do to the jaw sometimes?
3. What can a dentist do to crooked teeth?
4. What is the outside of the tooth called?
5. What two things must we do to the enamel?
6. Why must we keep the enamel clean and unbroken?
7. What harm do microbes do to the teeth when they are not perfectly dry and perfectly clean?
8. What does that teach us?
9. What do you need to use to clean teeth with?
10. How often should you wash them?

CHAPTER XXIX

EATING

I know a farmer who never hires a man to help him work on the farm until he has seen him eat. He says he can tell by the way the man eats whether he is likely to work well or not.

We are apt to think that a man is healthy, vigorous, and able to work if he has a good appetite; and when we hear a boy say, "I am as hungry as a bear," we are quite sure that he is well, while we also suspect that he is growing fast.

It is a good sign to feel hungry. In fact, that is the way the body rings the bell to tell us that it needs food to make flesh and brains out of. If a boy never felt hungry, he might be so busy with his tops, his balls, and his books as to forget his eating entirely. If he did not eat, he would grow thinner and weaker day by day until he was nothing but skin and bone and unable to walk, and at last he would stop living entirely. That is what happens when people starve to death.

Even when people have food enough they make great mistakes about eating. Every child should know four things in this direction.

1. What to eat.
2. When to eat.
3. How to eat.
4. How much to eat.

First of all, however, he needs to know a little about the part of the body that uses the food. He must bear in mind the important fact that it is a long tube, beginning with the mouth, enlarging as a stomach, then becoming a tube again. Parts of it are straight and parts are twisted; parts are large and parts are small; but every mouthful of food we swallow takes the same road through it.

The next time you eat, notice just what happens. You might try an experiment first: wipe your tongue perfectly dry and put a lump of sugar on it. You will be surprised to find that you cannot taste the sugar with a dry tongue. This is true of other kinds of food, for the fact is it is the saliva in our mouths that helps us taste anything. Yet the saliva has even more important work to do.

Put a piece of bread into your mouth. Perhaps you want to swallow it at once, but it is too hard and dry; so you crush it between your teeth and bite it into smaller and smaller pieces; your tongue turns it over and rolls it around, while you keep on chewing, and all the while the bread is getting damp and soft.

That is the main use of saliva: it gets the food ready for swallowing. Perhaps the wonder is where all the

liquid comes from. There are little pockets under the tongue and in the sides of the mouth; and the more saliva we need the faster these pockets make it and send it out for us to use.

We know how it looks: it is a thick kind of water, but it is very different from the water we drink. Any kind of water will make bread soft, but saliva is the only kind that can get food into the best condition for the stomach to use. The truth is that the saliva actually helps digest the food; that is why we need to take small mouthfuls at a time, and chew each mouthful until it is wet through and through with the saliva and turned into a smooth, thick pudding with not a lump in it. At that point it is ready to be swallowed.

WELL FED AND GROWING

It is a mistake to drink while we are chewing, for real water weakens the saliva. Do not drink until you have swallowed the mouthful you have been chewing.

We talk a great deal about eating, but there are only three things that we can do about it: we put the food into our mouths; we chew it; we swallow it. After that the long food tube of the body does everything else. Each part of this tube seems to be a special station that does some special thing to the food.

First comes the mouth that holds it and chews it. Next is the food pipe that does the swallowing. This tube sends the food into a queer-shaped bag that we call the stomach, and there it stays for two or three hours, while the muscles pull it in every direction and send the food round and round.

In the midst of all this a thick kind of clear liquid, called gastric juice, comes out of the lining of the stomach and makes the food as soft as pea soup.

It is about ready for the blood now, but, on the way, it must next go into the longest and most twisted part of the food tube. This is about twenty feet long in a man, and is folded into small compass below the stomach.

The dissolved part of the food passes through the lining of the tube, and after that the blood carries it to any place that needs it most, — to the bones, the skin, the hair, the lungs, and everywhere else where it is needed.

Even with the best of chewing there is always some waste, and this has to pass out of our bodies. It is exceedingly important that we get rid of it every day.

Now we are ready for questions about food.

1. *What to eat.* Most of the food we have on our tables is good for us. Milk and eggs, fresh meat, cereals, bread, vegetables, and fruits, — the stomach uses them all; but the time of the year makes a difference about what is best for us. In winter we need more butter, fat meat, and such things to help keep us warm; in summer, more vegetables and fruit are better, with less meat.

A little candy is good for almost everybody, if we eat it at mealtime, but it is not good for us between meals.

2. *When to eat.* If you are strong, eat three times a day, and be regular. Do not eat between the meals. The stomach works hard and needs to rest as much as a hard-working boy. If you are not strong, eat less at each meal, but eat oftener. In any case be sure to eat at regular times.

3. *How to eat.* Eat slowly and chew the food until it is soft like pudding or cream. Never drink in the midst of chewing. Even milk should be swallowed slowly enough to let the saliva mix with it, for otherwise it turns to curds in the stomach and is slow in digesting.

4. *How much to eat.* If you are healthy and have been chewing carefully, eat until you stop feeling hungry. Never eat until you feel stuffed.

The boy who works and plays and studies hard needs more food than his delicate mother who reads and sews all day in a warm room. Besides that, he is growing and she is not.

QUESTIONS

1. What does a good appetite show?
2. How much tasting can you do with a dry tongue?
3. What does this show?
4. What is the particular use of saliva?
5. Where does it come from?
6. How do you know when you have chewed anything long enough?
7. What does the stomach do with food?
8. How does the food get into the blood at last?
9. What are some of the things that we may eat?
10. When shall we eat?
11. How shall we eat?
12. How much shall we eat?

CHAPTER XXX

ALEXIS ST. MARTIN AND ALCOHOL

Many years ago there was a young man in Canada who was wounded in his stomach by a bullet. Perhaps this was not so very strange, for the fellow belonged to the American Fur Company and he hunted fur-covered animals for a living. The really strange part of the affair was this: the bullet went into his stomach in such a way that it did not kill him, although it tore the flesh so badly that it left a wide opening. Indeed, this opening was so large that it could never grow together again. You know most cuts heal up after a while, but all this one did was to stop bleeding and get healed around the edges. It never did more than that.

The result was that from that time on, as long as the hunter lived, there was an opening through the side of his body into his stomach. It was two and a half inches around, and there was a piece of the lining of the stomach that hung down over the opening like a valve and covered it up. If anybody wanted to look into the man's stomach, and if Alexis St. Martin (that was the hunter's name) would let him do it, all that was necessary was to push the valve back with the finger and peep in.

Now Dr. Beaumont was a physician who lived in the town where the shooting accident happened. He was acquainted with Alexis St. Martin, and as he was anxious to know just how the stomach works when it is trying to digest food, he invited the young man to come and live in his house and let him keep watch of his eating.

I suppose this was the first time in the history of the world that a doctor had had a chance to look into the stomach of a live man whenever he wished to see what was going on there. Dr. Beaumont was able to do this for several years, because St. Martin stayed with him a long time.

Fortunately for everybody the man was healthy and enjoyed eating; he chewed and swallowed, and drank water or milk or whisky just as Dr. Beaumont advised. In fact he seemed to be willing to eat anything the doctor gave him, and to eat much or little according as Dr. Beaumont wished to make his experiments, and so it came about that on certain days he ate one thing at a meal, while on other days he ate several different kinds of things at a meal.

As these experiments went on day after day, nothing that the young man ate or drank escaped Dr. Beaumont's eyes. He watched the food digest after each meal, and found out precisely how long it took St. Martin's stomach to get anything ready to go on into the next part of the long food tube. He also learned what kinds are the

easiest to digest, and he knew that what was good for St. Martin was good for other men too.

As it happened, Dr. Beaumont was a doctor in the United States army. He therefore decided that this was just the time to see whether it was best for a man to put alcohol into his stomach every day. He knew that if alcohol could help anybody it would certainly be good for soldiers, and I suppose he wanted to be sure about this so as to be able to advise soldiers to use it if it was really going to make them braver or stronger or healthier.

On the other hand, if wine or beer or whisky and such things were likely to do more harm than good, he wanted to know that too, so as to be on the safe side and advise soldiers against using anything of the kind.

Before this time doctors could only judge about alcohol by the way men felt and acted after they drank it. Nobody had seen how the stomach itself looked and acted when men put alcohol into it.

Even when Bum and Tipsy used alcohol, Dr. Hodge could not tell what the drink really did to their stomachs, for there was no hole for him to look through. He only knew that it made the dogs weaker than other dogs and not so brave.

Dr. Beaumont now proposed to find out something more than this, and fortunately, when he asked Alexis St. Martin whether he would be willing to have his

stomach used for the experiments, St. Martin said, "Yes, certainly."

One interesting thing to remember is that Bum and Tipsy had to take alcohol every day until Dr. Hodge could tell by their actions what was happening. But St. Martin did not have to take so much: when Dr. Beaumont looked into the stomach he saw exactly what the alcohol did when it got there, so he did not have to give it long enough to do the man any very great harm.

First of all he gave St. Martin good food without any alcohol in it, and at this time he noticed that when he gave him the food the inside lining of the stomach was of a pink color and perfectly healthy. The gastric juice was healthy too; it was thin and clear, without any special color, and it did its work well.

That is the way the stomach acted when St. Martin took food but did not drink alcohol. But now the young man took alcohol for several days, while of course he had his regular food besides. Everybody was especially interested in the case, and the doctor kept on examining the stomach each day. I think he was surprised to find that whenever he looked in the lining was redder than it was the time before; then there were sores on it; after that the sores were worse and blood came from them.

When he saw how things were going Dr. Beaumont took some of the gastric juice from the stomach (he could get it out easily by putting a tube in through the

opening) and noticed that it was not clear and thin as it was before. It had thick and ropy mucus in it.

On another day he took out more of the gastric juice and found a little blood in it too. This seemed to come from the sore places.

At first St. Martin could not tell from his feelings that anything was the matter with his stomach. He simply had to believe Dr. Beaumont, for of course he himself could not stretch his neck far enough over to look through the opening into his own stomach. But after a while he did not feel so well; he was dizzy and his face had a yellow color.

Dr. Beaumont tried his experiments over and over again at different times, and in the end he decided two things.

1. Alcohol made the lining of St. Martin's stomach sore and unhealthy, so that the gastric juice was changed, and after that it could not digest the food so well.

2. A man's stomach may have sores in it even when the man himself does not know anything about them. This means that a man cannot tell by his feelings what the alcohol is doing to his stomach.

If any one had the same kind of sores on the outside of his body that St. Martin had in his stomach, he would do all he could to get rid of them; because, even if a

man did not feel these sores at the time, he would know that they would do him harm and that he would not feel so well later. They would injure his body though he might not know what the matter was.

When Dr. Beaumont had found out all that he needed to know, he stopped giving alcohol to St. Martin; whereupon the lining of his stomach grew more healthy every day, until at last, when the doctor looked in one morning, he saw that it was quite well again.

Afterwards, when he wrote a book about these experiments, he said, "The use of ardent spirits always produces disease of the stomach, if persevered in."

QUESTIONS

1. Who was Alexis St. Martin?
2. What happened to him?
3. What did Dr. Beaumont wish to learn?
4. How did he make the food experiments?
5. What did he decide to find out about alcohol?
6. Before that time how did any one know what alcohol does to a man's stomach?
7. When the inside of St. Martin's stomach was healthy, what was its color?
8. After taking alcohol awhile, what change was there in the color?
9. What other bad signs did the doctor discover?
10. What did he say in his book about using alcohol?

CHAPTER XXXI

THE EXERCISE WE NEED

Give special attention at this time to the connection between your breathing and your exercise. Notice how quietly you breathe before you start to run; then go with a rush around the block, or walk up four flights of stairs at a brisk pace, and notice your breathing again. At the end of the exercise you will find that your lungs are working hard; you may even be panting as a dog does when he runs behind a carriage.

The fact is that the harder we use certain muscles of our bodies, the more air the body needs; while the more it needs, the harder the lungs try to get it.

Now it is the work of the large muscles that compels the body to call for the most air. However long and however hard you exercise the small muscles of your hand by opening and shutting your fingers, you can never get out of breath from doing it; but by making the large muscles of your legs move energetically enough to race around the block, you can make your lungs draw in all they can possibly hold. It is the work of the large muscles, then, that forces the lungs to supply the body with unusual quantities of life-giving oxygen. Remember

that point. Here is another point quite as important. When you come into the school building to-morrow morning, if you count your pulse at the foot of the stairs (provided that you have not been running just before that), you will find it beating quietly. But walk rapidly to the top of the building and count the rate of your heart beats again for a whole minute, and you will notice a great change; your pulse will now be pounding violently.

FEELING THE PULSE

The experiment shows that exercise increases not merely the breathing but also the circulation of the blood in the body.

The easiest way to feel the pulse is to put the hand on the side of the wrist toward the thumb. There you may count from seventy to one hundred pulse beats a minute. Sometimes hard exercise drives the pulse up to one hundred and fifty, but this is too fast. At other times, when one is lying very quiet, having been still a long time, it will beat much slower than seventy; and it is then that the heart does its resting.

In every case the heart beats because the muscles which are working must have more blood; and the heart meets the demand by pumping the blood into them as promptly as possible.

Moreover, with circulation as with respiration, it isn't so much the use of the small muscles as the use of the large muscles that makes the heart work. You can increase the heart rate a trifle by using the hand vigorously, but movements of the body and movements of the legs, as in running, increase the circulation very much more than exercise of the small muscles.

HARDENING A MUSCLE

Exercise also tends to make the muscles harder. Take hold of your right upper arm with your left hand; clinch the fist of your right hand as hard as possible; slowly bend the right arm, and you will feel the muscle of that arm increasing in size. This is because it is getting shorter. If you do this a good many times each day, the muscle itself becomes harder; that is, it has less fat in it and is better adapted for doing hard work.

Muscle that is used also tends to grow larger. It is interesting to measure the size of one's arm at the beginning of a year and then again at the end of the year, and see how much it has grown in size, if exercise has been taken.

HE STRENGTHENS HIS ARMS

Much more important, however, than either growth in hardness or size is growth in strength. If you take hold of a bar that is fastened as high as you can reach and pull your body up so that your chin is over the bar, the muscles of your arms and certain muscles of the back are doing hard work. A boy who can do this but once at the beginning of the term can easily, at the end of the term, — if he will practice three or four minutes night and morning, — do it five or six times. It is not worth while to do it for more than this length of time, for there is no advantage in having arms that are strong unduly in proportion to the rest of the body.

That which happens to the muscles of the arm when they are used in this way happens to all other muscles

when similarly used. No muscle can help growing bigger and stronger if it is used; whereas, if it is not used, it is just as sure to grow smaller and weaker.

Another point about exercise is that it increases one's appetite and one's digestion of food. This is accomplished very slowly, but a person who is working or who is out of doors a great deal will need more food than one who sits still most of the time.

The man who wishes to succeed in those athletic sports which depend on strength, quickness, or endurance trains for it; that is, he uses exercises which increase the circulation of his blood and which make the muscles harder, larger, stronger, and quicker in their movements, for these exercises make a man more healthy in every way.

Not only this, but the more he practices, the better can he do each particular thing, for muscles learn lessons as truly as children learn them.

Perhaps the most important reason for having gymnastics in school is that the body may learn to hold itself in the correct position and thus prevent curvature of the spine. This curvature often comes from bending over school desks so much of the time.

You will notice that your school gymnastics give more work to the big muscles of the back and the neck than to the smaller muscles of the arms. The reason is that the back must be straightened, and the exercises are to keep the muscles strong enough to hold the backbone

in its natural position. If they succeed, we may have the kind of carriage of the body that military men have; that is, we may be erect and vigorous.

Good health is closely related to standing straight. I do not mean that every person who stands as he should is healthy, and that every person who stands crooked is unhealthy; but I do mean that standing straight helps one to be healthy as well as to look healthy. To sit in a bad posture tends to interfere with respiration, digestion, and circulation. That is why a person who sits or bends over constantly feels so tired and cross at the end of the day; the different organs of his body have had to do their work in a cramped position, and they could not do it satisfactorily.

A person should never sit still longer than an hour at a time. Once in a while, he should stand up and take a two-minute exercise to increase circulation and respiration, to straighten his back and to cultivate good feelings.

Exercise is good, but one can take too much of it. Many people overdo in athletic work. I have seen several basket-ball teams and several relay teams who after they became expert played so many games and ran so many races that the boys were seriously overworked, — so much so that it took them years to recover.

A hard relay race should not be run oftener than once a week, and a team should play no more than one hard basket-ball game a week.

CHAPTER XXXII

ACCIDENTS AND EMERGENCIES

In these days Camp Fire Girls and Boy Scouts are always on duty. And wherever they are, whether in city home or in country camp, they show what kind of training they have had by the way they behave when unexpected events overtake them. The accidents described in this chapter show what may happen to us even when we are enjoying ourselves immensely. The next chapter tells what to do for each one of these accidents and for other accidents and emergencies too.

On a certain afternoon twelve Boy Scouts had been gathering twigs and branches for a glorious camp fire. Then they lighted it and sat about it talking and telling camp-fire stories. In the midst of it all came the fire accident. One of the boys sat rather near the blaze. While he talked he was throwing pieces of paper into the fire. And then, suddenly, without warning, a whirl of wind blew the blaze towards him. It set fire to his handful of paper scraps, to his blouse, to his necktie, and flashed upwards towards his face.

Every boy was on his feet in an instant. They were all shouting directions at once. But the boy who was on

fire did the one sensible thing. He threw himself flat on the ground and rolled over and over, away from the flames. At the same time another boy rushed up with a heavy blanket and wrapped it about the rolling boy even while he rolled. It was all done so quickly that the danger was over in a few seconds. The next chapter tells just what to do in an emergency of this sort.

At another time, in a girls' camp in Ohio, there were several accidents of different kinds, one after the other.

First, a girl was so frightened by the cry of "Fire! fire!" that she crumpled up in a heap and fell to the ground in a dead faint. The other girls were surprised enough, but they knew what to do. They stretched her out flat at once, brought cold water for her face, loosened her clothes, and rubbed her hands and feet. When she opened her eyes and said, "Why, girls, what's the matter?" they answered: "Oh, nothing much. You fainted, that's all. You're quite right now, aren't you?" The next chapter gives definite directions about what to do for fainting.

While this girl was unconscious one of the other girls hurried off to her tent for smelling salts. On the way back she stubbed her toe, fell across a narrow ditch full of old tin cans, cut her knee on a can cover, and sprained her ankle so that she could hardly move it. As she lay there she called out: "O girls! what shall I do! I've hurt myself awfully. I'm bleeding." Those girls had

their wits about them. They ran to her side, raised her carefully, treated the knee according to directions,[1] and used hot and cold water on the ankle as the rule for treating sprains directs. All this helped the girl, and by evening she was really quite comfortable again.

Strange to say, the very next day one of the girls who knew most about using hot and cold water for sprains had a hot-water accident of her own. She was lifting a heavy kettle when over it tilted and sent a scalding stream down upon her sandaled foot. Naturally enough, she screamed out with pain. But she also dropped to the ground and pulled off both her sandal and her stocking. Fortunately no skin came away with it. The burn was large, not deep, but still she suffered. "Girls, girls," she called, "do hurry up with the baking soda. The thing burns like fire." Once again some one knew what to do, and the burn was attended to in the right way. Find the directions in the next chapter.

In another camp one day several Camp Fire Girls were careless. Two of them found this out for themselves the next morning. They knew just what had happened to them when they wakened with red, swollen, itching hands. "Poison ivy!" they exclaimed. "We forgot all about the scrubbing." "We scrubbed," shouted the other girls. It seems they all knew that poison ivy grew in that region, and they knew how to save themselves

[1] See Chapter XXXIII.

from it, because they had been told. But after they had gathered twigs and branches for their camp fire, two of them forgot all about the rule for safety in poison-ivy regions. They now suffered because they had forgotten.

Two days later, while these same girls were talking matters over, they heard the terrible cry, "Man overboard!" They all heard it and, without a moment's delay, rushed to the bank that overlooked the lake. There they saw the whole situation. Two Boy Scouts in a fishing boat were rowing with might and main toward a sailboat that stood still with flapping sail. No man was in sight. Evidently he had fallen overboard or jumped overboard, for a small, bobtailed, black-and-white dog was barking furiously and running up and down the deck of that deserted sailboat.

The girls watched. They saw the boys reach the sailboat and row round it, peering all the time down into the water. Then, suddenly, one of them jumped to his feet, stood on the edge of the boat, and dove headfirst overboard. Less than half a minute later he was in sight again, holding on to something that dragged down heavily. Pretty soon this heavy thing turned out to be the man himself. He had all his clothes on — collar, necktie, coat, shoes, and all. The boys tugged and pulled, and finally got him into the boat. The girls kept on looking and saw him lie there as if no life were left in his body. They saw the boys stretch him

out straight at full length, face downwards and turned to one side. They saw those boys work for fifteen minutes to make the man begin to breathe again. (The next chapter tells how this is done.) At the end of the fifteen minutes the man turned over, then sat up.

At this point, one of the girls who was watching was so much excited that she burst into tears, while two or three other girls hurried off, saying, "We must get hot-water bottles and blankets ready for that man when they get him ashore."

Before long he arrived with the boys and the dog, the dog wagging his tail joyously. And, as they landed from the boat, one of the boys called out, "Well, what did you think of our stunt?" "Stunt!" they exclaimed. "What stunt? What do you mean?" Then the truth came out. It seems the man was Dr. Scott, head master of the Boy Scouts across the lake. He had promised to let himself seem to be drowned for the sake of giving the boys practice in bringing him to life again. He praised them for the way they did it. The girls said they liked everything about it except the fright.

As they talked, a group of boys came up, carrying another boy with a very white face. He sat on a seat made by their crossed hands.

"Now what's up?" asked Dr. Scott.

"Jim's cut his leg," said one. "He's cut some veins, not an artery," said another.

"How do you know that?" asked the doctor.

"By the way it bleeds," said Jim himself. "It does n't go in spurts."

"Quite right," said Dr. Scott. "Arteries bleed in spurts. You 've done the right thing. You 've stopped the bleeding with your two tight bandages." From this point on, the doctor himself took charge of the wound.

How the Seat is Made

It was several days after this that the same doctor gave a talk to a meeting of both Camp Fire Girls and Boy Scouts. He talked about different kinds of wounds, and he told them just what the difference is between deep cuts, shallow cuts, and punctured wounds. He made them understand what to do in all sorts of accidents with needles, scissors, nails, fishhooks, glass, sharp pieces of wood, hatchets, knives, and other cutting instruments. He also told them what to do for snake bite, for dog bite, for frost bite and for chilblains, for sunstroke, for choking, and for Fourth of July accidents. The rules

which he gave for all these things are printed in the next chapter.

While the doctor was talking, a pale-faced boy rose to his feet, holding a handkerchief to his face. By the color of the handkerchief, every one knew he had nose-bleed. "Tilt your head backwards and stand quite still, my boy," said Dr. Scott. Then he opened his medicine case full of bandages and bottles, and took out a package of powder. "Alum," he said. "This 'll do the work." He poured a little of it into the palm of his own hand, held it to the boy's nose, and said, "Sniff it up gently. It will pucker the blood vessels and stop the bleeding." And so it did. The trouble was quite over in ten minutes. The talk about accidents then went on to the end. Just before he stopped talking, Dr. Scott said: "In case of accident two things are always equally important — *first*, knowledge as to what to do; *second*, a clear head and quick action. Never lose your wits. Keep calm and do what is needed at once. At the same time always be sure to send for a doctor if there is any real trouble."

The next chapter gives rules which apply to various kinds of accidents. Learn the rules by heart if possible.

QUESTIONS

1. How did the fire reach the boy?
2. What did he do at once?
3. Why did he roll over and over?
4. What did another boy do with the blanket?

5. How soon was the danger over?

6. What happened to a girl in another camp when she was frightened?

7. What did her friends do for her?

8. What happened to the girl who went for smelling salts?

9. Describe the hot-water accident.

10. What did poison ivy do to the hands of the girls?

11. What cry did the girls hear two days later?

12. Describe what they saw from the bank.

13. How long did the boys work to make the man begin to breathe?

14. Who was Dr. Scott?

15. Why did he let himself seem to be drowning?

16. What happened to Jim?

17. What did the boys do to stop the bleeding?

18. What were some of the accidents that Dr. Scott talked about the next day?

19. When the boy had nosebleed, what did Dr. Scott tell him to do?

20. In case of accident, what two things did Dr. Scott say were always equally important?

CHAPTER XXXIII

RULES FOR ACTION IN CASE OF ACCIDENT

Study each one of the following rules and decide which ones were used after the different accidents of the last chapter.

When clothing is on fire. Flames always blaze upwards fast. They burn sidewise slowly. For this reason, when clothes are on fire, the face, eyes, and hair are in the greatest danger. In order to save them, drop to the ground at once. Lie out flat. This will put your head and your hair out of danger. Roll over and over. This will help smother the flames. Or, catch up a rug, a blanket, a quilt, or a shawl — anything of the kind will do — and wrap it tight about the body. This will keep the air out and smother the fire. Make sure to wrap from the neck downwards. This will keep the flame from the face. Never wrap from the feet upwards. This would drive the fire towards the face. Never run. This would only fan the flame. In every possible way smother the fire. Work fast. Keep calm.

For fainting. The person who faints has so little blood in the brain that he is unconscious. He is very pale. Lay him flat on the floor or on a couch. This will

make it easier for the heart to pump blood into the head. Raise the feet and legs higher than the head. To do this, prop up the foot of the couch. This will help carry blood into the head. Loosen the clothing about the neck and the waist. Wet the face and the neck with cold water. Rub the hands and the feet to make the blood move faster through them. Give a whiff of smelling salts or of cologne from a handkerchief. Call the doctor unless the person recovers within a minute or two. When he recovers, his face will be pink again. He will be able to think and to talk. This will show that the heart is doing its work, and that, once again, there is blood enough in the brain.

The sprained ankle, knee, or wrist. If the sprain is very severe, call the doctor. He may find that some of the small bones in the ankle or the wrist are dislocated. They may even be broken. Little can be done until they are put right, and only a doctor's trained hand can do this. Until he comes, keep the sprained part raised so that blood may not flow fast into it. If the trouble is a mere sprain, without dislocated bones, use hot and cold water on it alternately; first hot water for five minutes, then cold water for two minutes. Keep this up for fifteen minutes. After that, in some cases a sprained ankle may do well if it is strapped up very tight in a high shoe with cotton batting about the sprained part. A doctor should decide what is best.

The treatment of burns. If a burn is large or deep, always call a doctor. But, even before he comes — if the skin is not off — cover the burned spot with a paste made of baking soda and water. Hold the paste in place with a soft cloth. This paste will exclude the air and reduce the pain. If the skin is off, mix together sweet oil or linseed oil with about four times as much lime water. Shake thoroughly. Pour the mixture on the wound. Even flour paste is better than nothing.

For ivy poisoning. If you have been where poison ivy grows, scrub your hands and face with soap and water as soon as you reach home. By doing this you will get rid of the oil from the leaves before it has time to irritate the skin. If you are poisoned already, wash the parts with hot water. This sometimes reduces the discomfort.

When poison has been swallowed. Send for the doctor without a moment's delay. But, even before he comes, compel yourself to vomit if possible. To do this, use a tablespoonful of mustard in a quart of lukewarm water. If there is no mustard in the house, use salt instead. Drink as much of this mixture as you can. Then tickle the throat by thrusting your finger down and touching the palate. Bend far over a basin placed on the floor. The contents of the stomach will pour out. Drink still more water. Empty the stomach again. Water dilutes the poison, making it weaker and less harmful. Vomiting gets it out of the body in the quickest possible way.

Keep a clear head and work fast. In a case of poisoning, every moment counts.

What to do for choking. Bend forward, with the head down. Have some one slap you vigorously between the shoulders. Tickle the throat with the finger to make yourself vomit. Cough energetically. Send for the doctor unless you have relieved yourself soon.

The treatment for snake bite. Snakes are usually more frightened than we are when they meet us, and snake bites are very rare. But if one occurs, do the following things as promptly as possible. Tie a necktie or any other convenient cloth tight about the leg between the bitten spot and the heart. This is to keep the poisoned blood from going to the heart and being sent out into the whole body. If your lips have no cracks or sores on them, suck the wound to draw out the poison. Suck hard, then spit it out. This helps. A doctor might sterilize his small, sharp knife in a flame or in an antiseptic solution, then cut the flesh over the wound. This will make the blood flow, and will help get rid of the poison of the bite.

In case of dog bite. A doctor must decide whether the dog was probably mad or not. If he was mad, the same doctor will send the bitten person to some hospital as fast as possible. There he will receive what is known as the Pasteur treatment. This will save him from the awful suffering of hydrophobia. If the dog was not mad, the wound should be cleaned thoroughly and

treated like any other puncture of the skin. Never really tease a dog. Most dog bites are from dogs that have been teased until they are cross. No friend is more faithful and true than a dog that is well treated.

The treatment for punctured wounds. Such wounds may be made with any sharp thing — scissors, needles, nails, fishhooks, fence barbs, sharp bits of wood, of glass, and the like. First of all, make sure that no scrap of cloth, wood, glass, rust from the nail, or bit of broken needle has been crowded into the flesh and left there. To remove such bits, use tweezers or a needle after it has been held in a flame to kill the microbes on it. If the wound is deep, a doctor should by all means see it and clean it. The one important thing is to leave no outside substance in it, because microbes will be there too. They do the mischief. If the wound did not bleed much when it was made, wash it thoroughly with water and soap. Even squeeze the spot gently to make it bleed. This will help wash away the microbes which may have been lodged in it when it was punctured. Last of all, wet a piece of soft cloth or cotton batting in some antiseptic solution which a doctor recommends. Put this over the wound and tie it in place. The antiseptic will kill the microbes. If the wound is thus freed from living microbes, — that is, if it is perfectly clean, — it will heal fast. If it is not clean, great harm may come from the activity of the microbes. Tetanus

microbes may be on a rusty nail or on soiled glass or wood that punctures the foot, and it is these microbes that give the terrible malady known as lockjaw. A doctor is needed for every wound from rusty nails.

When any soft part of the body is bruised. Dip a good-sized piece of flannel in very hot water. Put it in a dry towel and wring out most of the water by twisting the ends of the towel. Lay a dry flannel over the bruised spot. Place the hot, wet flannel on the dry one. Cover both with a thick, dry cloth. Let them stay in place until the bruised spot begins to feel cooler. Then exchange the wet flannel for one that is really hot. Continue this treatment for fifteen minutes, then take off all the hot cloths. Wash the bruised spot in cold water. This prevents taking cold afterwards. Dry carefully. The same treatment often relieves toothache, a stubbed toe, a jammed finger, a stiff neck, etc.

For frost bite. If the nose, the ear, the cheek, the toes, or the fingers are frozen somewhat, put them into snow or into ice-cold water until the stiffness is gone. Dry them carefully. The skin is very tender. It will break easily. Run no risk of a second freezing.

In case of chilblains. Wear comfortable shoes. Keep the feet perfectly dry. Rub them with kerosene oil or with turpentine at night, then heat them thoroughly. This sometimes helps by improving the circulation of the blood.

Artificial respiration for drowning people. Wait for nothing. Remove no clothes from the person. Work fast. Every moment is precious. Lay him flat on the ground, face downward but turned to one side so that nose and mouth may help when breathing begins. Kneel astride of his legs. Put both hands on the small of his back, against his lowest ribs. Bend forward and press downward as hard as possible on the ribs. Count three while you do this. Let go the pressure and swing back while you count another three. Bend forward again. Press downward with all your might while you count three once more. Keep up this pumping at the rate of ten or twelve times a minute. Don't stop until an hour has passed unless he begins to breathe sooner. This is known as artificial respiration. It may be used to bring breath back to a breathless football player, or to a person almost suffocated with illuminating gas. After the

BEND FORWARD AND PRESS DOWNWARD

LET GO THE PRESSURE AND SWING BACK

breathing begins, wrap the person up in dry blankets. Warm him with hot-water bottles. Rub his body, his arms, and his legs. Rub always towards the heart.

What to do for deep and for shallow cuts. Arteries are buried so deep that an ordinary cut does not often reach them. But when blood comes in spurts and is bright red, we know it comes directly from an artery. We also know that life is being endangered, and that the flow must be stopped at once. To do this, fold a handkerchief or piece of cloth so that it will be long enough for a bandage. Tie a knot in the middle of it with a pebble or some other hard thing within the knot. Put this knot just above the cut, — not on it, but between it and the heart. Tie the handkerchief as tight as possible. By doing this the pressure will be where it belongs. It will keep back the blood that is coming from the heart through the arteries. If this tight bandage does not stop the bleeding, then take a lead pencil, or any other small stick. Slip it through the handkerchief opposite the knot, and turn it round very carefully so as not to bruise the flesh. This makes what is known as a tourniquet. Let it squeeze the artery just hard enough and no harder than to stop the bleeding. Do all this while waiting for the doctor. But get one as promptly as possible. When the blood from a wound is dark red and flows in a steady stream without spurts, we know it comes from a vein and not from a deeply

buried artery. Blood in the veins is dark red because it is impure. It is on its way back to the heart. To stop the bleeding from cut veins, tie one tight bandage above the cut and one below it. The doctor will attend to matters after that.

When bones are broken. As a rule, the pain will be very severe. The main thing is to keep the bone motionless until the doctor comes. Call him at once. He will set the bones and use splints to hold the parts in place. After this, he may examine with the X ray to make sure that the bones are set right.

Treatment for nosebleed. Hold the head up and slightly tilted backwards. Put ice on the back of the neck and on the bridge of the nose. A towel may hold the ice to the neck. Another may hold it across the forehead and on the nose. Gently sniff up powdered alum. It will pucker up the bleeding blood vessels in the nose. If bleeding continues, soak the feet in hot water. This draws blood away from the head. Wet the corner of a handkerchief in alum water and thrust it into the nostril. Or use a bit of soft cotton with a string tied to it to pull it out by. Draw the cotton out very carefully after the bleeding has stopped. Wait for a good while before blowing the nose because the bleeding may easily start again. Compress the nostrils from the first.

To remove particles from the eye. Never rub the eye. Instead, close it for a few minutes. Tears will start.

These will help wash the dust or cinders down into the tear duct. Now blow the nose. If this does not drive the fragment out, try another plan. Take hold of the upper eyelashes, and draw the lid outward and over the lower lid. The particle may be left there. Or, while holding the lid out, dip the eye in water. Or let a friend turn back the upper lid. The fragment may be seen on it. Wipe it off with a soft, damp cloth.

Fourth of July accidents. These are often worse than accidents on other days, because things that explode and tear the flesh make ugly, ragged wounds. But wounds made on the Fourth of July — whether they are punctures or bruises or bleeding cuts — must be treated just as the rules of this chapter demand. And they must be attended to at once. Delay may mean great suffering and even death. In every case of accident keep a clear head. Be calm. Don't be frightened. Clean the wound. Stop the bleeding. Call the doctor.

QUESTIONS

1. Tell what to do when clothing is on fire.
2. What must be done when a person faints?
3. Describe the treatment for sprains.
4. What is the treatment for burns?
5. How may one prevent ivy poisoning?
6. If poison has been swallowed, what should be done?
7. What may one do for choking?
8. In case of snake bite what is to be done?

9. What is the danger from dog bite, and what should be done?

10. Describe the treatment for punctured wounds.

11. What should be done for a bruise?

12. Give the treatment for frost bite; for chilblains.

13. When a person has been taken from the water almost drowned, how will you make him breathe again?

14. Which are more deeply buried in the body, arteries or veins?

15. When blood flows in spurts, is it from an artery or from a vein?

16. When it flows in a steady stream and is dark red, where does it come from?

17. If an artery is cut, what will you do to stop the bleeding?

18. Why should the tourniquet be turned very carefully?

19. What should be done to stop the bleeding from veins?

20. What is the treatment for broken bones?

21. Describe the treatment for nosebleed.

22. How may we get particles out of the eye?

23. Why are Fourth of July accidents often worse than other accidents?

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GLOSSARY

Key. fāte, senāte, făt, ärm, a̤ll, åsk; mēte, ẻvent, mĕt, hĕr; īce, ĭt, sīr; ōld, ŏbey, nŏt, sòn, hôrse; ūse, ŭnite, ŭp, ûrn; babў; c *as in* call, ç *as in* mice; g *as in* go, ġ *as in* cage; ti *as in* motion; obscure sounds: a̤, e̤, i̤, o̤, ṳ. Silent letters are italicized.

ăb'stĭ nę̤nçe, the act of refraining from the use of something.

ăr'tēr ў, one of the tubes which carry the blood from the heart.

ăth lĕt'ĭc, strong; active.

băc tē'rĭ å, the smallest living creatures.

căr'bŏn dĭ ŏx'ĭde, carbonic acid; a gas.

căr'tĭ lăġe, an elastic tissue; gristle.

chĭl'blāin, a sore produced by exposure to cold.

çĭl'ĭ å, hairlike growths on various membranes and organs of the body.

çīr cŭ lā'tiŏn, the act of moving in a circuit or circle.

cŏn sŭmp'tiŏn, a name commonly given to tuberculosis of the lungs.

dēr'mĭs, the second layer of the skin; the true skin.

dĭs'lŏ cāte, to put out of joint.

ĕp ĭ dĕm'ĭc, common to or affecting a great number.

ĕp ĭ dēr'mĭs, the outer layer of skin.

ẽ văp'ŏ rāte, to pass off in vapor.

fēr mĕnt', to turn sour through action of microbes.

găr'băġe, any worthless, offensive matter.

găs'trĭc, belonging or pertaining to the stomach.

hȳ drō phō'bĭ å, a disease commonly caused by the bite of an animal.

ĭn tŏx'ĭ cāte, to make drunk.

mĕm'brāne, a thin, soft tissue in the form of a sheet or layer covering parts of the body.

mĕr'cū rў, often called quicksilver; used in thermometers.

mī'crōbe, the smallest living creature that can be seen only through a microscope.

mī'crŏ scōpe, an instrument for examining objects too small to be seen by the naked eye.

mŏ nŏt'ŏ nŏŭs, unchanging.

mū'coŭs, secreting mucus.

mū'cŭs, a thick fluid formed by the mucous membranes of animals.

ŏc'ū lĭst, one skilled in the treatment of the eyes.

ŏx'ў gĕn, the element of the air that supports life.

Păs'teûr' treatment, a method of inoculation as a preventive of certain diseases.

pēr'spĭ rā'tiŏn, the liquid poured out on the surface of the skin by the sweat glands.

punc'tūre, a small hole pierced by a sharp instrument.

rĕs pĭ rā'tiŏn, the act of breathing.

rĕs'pĭ rā tŏr, an instrument used as an aid in breathing.

să lĭ'vă, the liquid secreted by the salivary glands and poured into the mouth.

tĕt'ă nŭs, a dangerous disease (lockjaw).

thēr mŏm'ĕ tēr, an instrument which tells temperature.

tourniquet (tōōr'nĭ kĕt), an instrument to hold back the flow of blood.

tûr'pĕn tīne, an oily product of pines.

vein (vān), a tube which receives blood from the capillaries and returns it to the heart.

vĕn'tĭ lāte, to supply with fresh air.

vĕn'tĭ lā tŏr, a means by which fresh air is supplied to a room or building.

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